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C. A. B.
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Plant Breeding Abstracts

Vol. XXX, No. 2

STATISTICS

956 Wang, C.-M.
[A comparative study of eight statistical treatments of experimental data in the form of fractions (or percentages)].
Tai-wan Ta-hsueh Nung-hsueh-yuan Yen-chiu Pao-kao/Mem. Coll. Agric. Taiwan Univ. 1958 : **5** : No. 2 : 1–24. [Chinese].

Eight different methods of normalizing data of the above type by scale transformation or weighting were tested by the method of Box and Anderson. Square-root transformations were found to be the most useful.

957 Sandison, A.
Influence of site and season on agricultural variety trials.
Nature, Lond. 1959 : **184** : No. 4689 : Suppl. No. 11 : p. 834.

A review of the varietal trials conducted at a series of locations in England and Wales by the National Institute of Agricultural Botany and involving such crops as cereals, mangels, lucerne, potatoes and cauliflowers has shown that the standard deviation of relative yield ranges from 10 to 16%. Moreover, the error varies with variety and it may be that varietal differences are not additive. The results show that it is more important to cover the main environmental conditions by multiplying locations than to go for high accuracy in individual trials.

958 Nonnecke, I. L.
The precision of field experiments with vegetable crops as influenced by plot and block size and shape. I. Sweet corn.
Canad. J. Pl. Sci. 1959 : **39** : 443–57.

The effect of different plot and block sizes and shapes on yield variability was investigated. When plot size was increased it was found that the greatest reduction in variation occurred when block shapes of 6 x 1 plots and 3 x 2 plots were widened, and when block shapes 1 x 6 plots and 2 x 3 plots were lengthened.
From considerations based on the coefficients of variation and from the application of Smith's law, a single-row plot 20 ft. in length was found to be the optimum size of plot, with a plot 10 ft. long and two rows wide almost as efficient.

GENETICS

959 Dittrich, M.
Wege zur Synthese in der Genetik. **(Ways towards a synthesis in genetics).**
Forsch. Fortschr. dtsch. Wiss. 1959 : **33** : 289–95.

In this historical survey, an introductory section is followed first by an account of classical genetics, and then by a review of modern genetics in which the topics touched upon include genome research, research on cytoplasmic and plastid inheritance, Mičurinism, the gene concept and the inheritance of acquired characteristics.

960 Conferencias del Profesor Kappert, sobre genética. **(Lectures by Professor Kappert on genetics).**
Agricultura, Madr. 1959 : No. 325 : 269–71.

A report is presented of three lectures delivered by H. Kappert at the National Institute of Agronomic Research at Madrid in April 1959. In the first, entitled The genetics of cytoplasm, examples of maternal inheritance and of interactions between genic and cytoplasmic inheritance are reviewed and the localization of cytoplasmic factors in various organisms is considered. The second lecture, on The inheritance of flower colour, deals with both the genetics and the chemistry of flower colour. The third, on Problems of genetics and selection in polyploidy, is concerned with differences between alloploidy and autoploidy and with the dosage effects of different genes in polyploid organisms.
Two colloquia were held at the same time, one on current problems in genetics and the other on breeders' rights.

961 Wright, S.
Genetics and the hierarchy of biological sciences.
Science 1959 : **130** : 959–65.

Discussing the increasing interpenetration between genetics and other fields of biological enquiry, the writer suggests that genetics is becoming the means of binding the various branches of biology into a unified discipline.

Abstracts of papers presented before the Radiation Research Society, Pittsburgh, Pennsylvania, May 18–20 1959.

Radiation Res. 1959 : **11** : 430–79.

962 *Hutchinson, F. & Arena, J. The inactivation of transforming principle DNA in intact cells by ionizing radiation.* (*p. 447*).

"Pneumococcus cells resistant to the action of streptomycin at moderate concentrations were irradiated with Co^{60} γ-rays. The DNA was then extracted from the cells and used to transform genetically a strain of pneumococcus which is sensitive to streptomycin to the resistant type. When the cells were irradiated in suspension at room temperature, the survival curve was exponential over a factor of 10^4, with a 37% dose of 1·3 megarads. When the cells were irradiated in the dry state, the survival curve was again exponential, with a 37% dose of about 4 megarads. The increase in radiosensitivity from the dry to the wet irradiations is presumably due to the effect of water radicals produced within the cell. The observed increase is roughly consistent with the ionic yield for the inactivation of transforming principle in dilute solutions observed by De Filippes, and a mean diffusion distance of about 20A for the water radicals within the cells."

963 *Kirby-Smith, J. S. Electron spin resonance in DNA and protein and its possible bearing on chromosome breakage.* (*pp. 448–49*).

"In dry highly purified DNA only a weak resonance can be observed in material exposed to $\sim 10^6$ rads of X-rays, thus confirming results reported for DNA by other investigators; in DNA samples known to contain an appreciable protein component a strong resonance is observed. Exposure of the highly purified DNA to approximately the same doses of ultraviolet radiation induces a very definite and larger resonance signal than that found for X-rays. The inverse phenomena are observed in protein." These results are thought to support the view that the sites of primary damage on a chromosome strand are different for ionizing and ultraviolet radiation and that with ionizing radiation the primary breakage mainly involves the protein of the chromosome and with ultraviolet radiation the nucleic acid.

964 *Kølmark, G. Chemical protection against radiation effects in* Neurospora crassa. (*p. 450*).

Treatment of conidia of a mutant strain requiring adenine for growth with 0·005 to 0·02 M β-mercaptoethylamine in water or saline before and during X irradiation caused a marked increase in survival and a decrease in the rate of reverse mutation at all the dose levels of X rays tested. The chemical had no toxic or mutagenic effect at the concentrations used.

965 *Wimber, D. E. & Sparrow, A. H. Cytogenetic consequences of incorporated tritium-labelled thymidine in* Tradescantia. (*p. 478*).

Up to 72 chromosome fragments per 100 cells at anaphase were found in root-tip cells of *T. paludosa* after continuous exposure to 1 μc/ml. isotope solutions for various periods up to 56 hr. Autoradiographs of root squashes showed that the average activated silver grain count over dividing nuclei increased as the fragmentation appearing at anaphase increased. Cells that absorbed large quantities of H^3-thymidine were apparently arrested in development before entering mitosis. Phenotypic alterations in petal colour, presumably somatic mutations, were produced by incorporated H^3-thymidine in plants heterozygous for flower colour.

Abstracts of papers read at the Hundred and Twenty-Ninth Meeting of the Genetical Society of Great Britain, held on 19th and 20th March 1959, at the University of Birmingham.

Heredity 1959 : **13** : Pp. 411–16.

966 *Riley, R. Polyploidy in wheat.* (*p. 411*).

Hexaploid *Triticum vulgare* shows only bivalents at meiosis, although its genomes are derived from cytologically related species and equivalent chromosomes of the three genomes are genetically very similar. The "diploid behaviour" is controlled by one or more genes on one chromosome in the absence of which intergenomic pairing occurs. This finding is said to make possible a simplified concept of the evolution of polyploidy. [Cf. XXIX, 3644].*

967 *Smith-Keary, P. F. Reversions of the leucine auxotroph* leu–151 *of* Salmonella typhimurium. (*p. 411*).

" 'Reversions' of the leucine auxotroph *leu*–151 of *S. typhimurium* to leucine independence are of three types, fast, slow and unstable, distinguishable by their growth in the absence of leucine. The fast growing type is probably due to a back mutation of *leu*–151 to *leu*–+. The slow type has been shown by transduction tests to be due to a suppressor mutation, (*su–leu*) at a locus which is linked to *leu*–151 and to *ara*–9.* This suppressor is allele specific in that it has no effect in combination with *leu*–39. A linkage map of the region has been plotted and the order of the markers shown to be *su–leu*, *leu*–151, *leu*–39, *arg*–9. The unstable type, also slow growing, spontaneously reverts to auxotrophy at a very high rate. The instability has been shown not to extend to the *methionine A* and *tryptophane B* loci, in that the mutation rates of *me* A–22 and *try* B–2 to prototrophy are unaffected."

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* References in square brackets are to volume and number of entry in *Plant Breeding Abstracts.*

[Author's summary].

968 *Anderson, G. E. Induced mutants in* Coprinus lagopus. (*pp. 411–12*).

After ultraviolet irradiation of oidia, 250 mutants were isolated, most of which were biochemical; mutants showing adenine and methionine requirements were most frequent. Several methods of isolation were tested and "the transfer of colonies from seeded plates to complete slants before testing to minimal medium appeared to give a better result than testing colonies directly to minimal medium and rescuing non-growers (auxotrophs) to complete medium." The total isolation method yielded about 1% mutants amongst survivors and filtration enrichment doubled the yield. Thirty-six auxotrophic and seven morphological mutants were tested for linkage with mating-type loci; 10 of the auxotrophs were found to be linked with the *A* locus and these include mutants requiring methionine, paba and arginine. Four mutants responding to choline were linked with the *B* locus. Tetrad analysis of two markers linked to *A* and three linked to *B* were used to determine their linear order and position in relation to the centromere.

969 *Auerbach, C. Spontaneous mutations in dry* Neurospora *conidia.* (*p. 414*).

"Arwood's heterocaryon for the scoring of recessive lethals was used in an attack on the problem whether spontaneous mutations arise in non-duplicating genes. This method, in contrast to previous ones, detects only mutations which arise before plating, and excludes those which arise on the plate through replication errors. The results show that lethals arise at a constant rate in dry conidia. Under the conditions used, this rate was 0·3% per week at 32°, and considerably lower at 4°. When spores kept at 32° were transferred to growth medium, a high proportion of the already present lethals was lost during the initial establishment of a growing front; subsequently, mutation frequency increased at about twice the rate found for dry conidia. A spore sample which had spent the first six months at 4° and the seventh at 32° contained at least as many lethals as spore samples which had been kept at 32° throughout. If this result can be confirmed, it suggests the existence of a two- (or multiple-) step process, with only the final step showing marked temperature dependance."

970 *Pritchard, R. H. A model for recombination before zygotene pairing.* (*p. 415*).

Recombination by "copy-choice" is said to require homologous contact between chromosomes during replication. However replication of DNA occurs before zygotene pairing in some organisms.

In *Aspergillus*, only a small fraction of the total genetic length is available for recombination in any one cell. "The necessary condition for recombination is called effective pairing to distinguish it from cytologically observable pairing." Effectively paired segments have a mean length of about 0·4 map units and a mean exchange frequency per segment of 0·6 corresponding to a recombination fraction of 35%. The frequency of recombination between loosely linked loci is largely determined by the frequency of effective pairing between them. Should effective pairing be equivalent to homologous contact, chromosomes need only be in contact at a few points during recombination to account for their genetic length; cytologically observable pairing is unnecessary. There is however no direct evidence supporting this suggestion. If it were correct, the fact that chiasma frequencies are greater in triploids and trisomics than in the corresponding diploid could be accounted for by the increased probability of homologous contact between pairs of chromosomes when three are present instead of two.

971 *Howard, H. W. Differentiation in the potato tuber.* (*p. 416*).

Eyes were removed from the "white-splashed-purple" tubers of a seedling of *Solanum tuberosum*; adventitious buds were then produced from the inner tissues and some of the resulting plants had white tubers. Clonal generations from these white tubers and from the original white-splashed-purple tubers remained true to type. White-tubered varieties were crossed with plants with purple-splashed tubers and with the white-tubered plants obtained in the experiment. In each case a segregation of 11 white-splashed-purple: 13 white was obtained. It is thought that these results may be most simply explained by assuming that the cells of the inner tubers differ from those of the epidermis and the periderm derived from the epidermis in being unable to produce the purple pigment. These inner cells do not acquire this capacity when they are made to become epidermal cells, although they carry the gene for white-splashed-purple periderm.

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* Presumably *arg*-9,

972 Darlington, C. D. *et al.*
Bibliography. 1926–1958.
Botany School, Oxford. Pp. 32.

This bibliography consists of four parts: (1) original papers and books by C. D. Darlington and in collaboration, (2) original papers by collaborators, (3) general papers by C. D. Darlington and (4) translations of books.

973 van der Veen, J. H.
Tests of non-allelic interaction and linkage for quantitative characters in generations derived from two diploid pure lines.
Genetica 1959 : **30** : 201–32.

The analysis of continuous variation devised by Hayman and Mather [XXVI, 813] is extended to permit of new tests for nonallelic interaction and linkage. Tests for nonallelic interaction based on generation means are set out, also tests of trigenic and higher interactions based on second back-cross data. Tests for nonallelic interaction and linkage based on second degree statistics follow, special attention being paid to comparisons between the variances of second back-crosses. The linkage tests are not biased by nonallelic interaction or genotype-environment interaction.

974 Miyake, T.
Fertility factor in *Salmonella typhimurium*.
Nature, Lond. 1959 : **184** : 657–58.

Gene *mut*, known to enhance the rate of spontaneous mutation of other genes, probably increases the frequency of alteration from the infertile to the fertile condition in crosses within *S. typhimurium* and in combinations between this bacterium and *Escherichia coli* [cf. XXIX, 3381].

975 Clausen, J. & Hiesey, W. M.
Balance between coherence and variation in evolution.
Science 1959 : **130** : p. 1413. (Abst.)

"Recent experiments have disclosed that even ecological races within the same wild species are held together by moderate genetic coherences, and the segregations of their hybrids favor the parental combinations. In ecological races each morphological and physiological character is regulated by a system of several genes distributed on several chromosomes. In their segregating hybrids, combinations of paired parental characters are usually correlated, indicating that at least two pairs of the regulating genes are located on a common pair of chromosomes, whereas other genes governing them may recombine freely. The racial characters are thus held together by direct and indirect bonds of various strength. This kind of genetic structure provides both coherence and flexibility. It favors the retention of the existing races even at their points of contact as long as the differentiating environments remain essentially unchanged. Major changes in the environment, combined with interracial crossings, may favor certain crossover combinations if they are better adapted, and the existing linkage mechanism will accelerate the constancy of the favored recombinants. New variability is simultaneously released, because complementary and oppositional genes carried by separate races become activated through crossing, producing transgressive segregation. Shifts in the environment tend to alter the balance between coherence and variation, promoting migration, natural crossings, release of potential variability and shifts in selective pressure. Such shifts change the biotype content of the races and of the species itself."
[Authors' summary].

976 Fox, A. S.
Problems in genetic control of protein synthesis.
Science 1959 : **130** : 1417–18. (Abst.).

"Recent advances permit the following formulation of the problems of the genetic control of protein synthesis. Each statement is suggested by existing evidence, but full validation lies in the future. (i) The outstanding biological property of proteins is specificity (enzymatic and immunological). Genetic alteration of purely physical properties (thermostability, electrophoretic mobility, and so forth) occurs, but constitutes a less critical problem. (ii) The important variables of the protein molecule are those of primary structure (amino acid sequence) and tertiary structure (folding, polymerization, and so forth). While the primary structure specifies an array of potential tertiary structures, the particular tertiary structure assumed in any case depends on other factors. (iii) The groupings responsible for specificity are large enough to extend over a segment of the polypeptide chain consisting of several adjacent amino acids or over two or more nonadjacent segments brought into juxtaposition by folding of the chain. Alterations of either primary or tertiary structure could therefore affect specificity. (iv) Primary structure is a product of events occurring in the ribosome and is probably a reflection of the structure of ribosomal RNA. The sequence of nucleotides is probably the structural feature of greatest importance in this regard, but such features as folding of the polynucleotide chain cannot be dismissed. (v) Full specification of tertiary structure occurs subsequently. While nonspecific factors might play a role, it is difficult to avoid the participation of templates at this point; this may be an additional function of RNA. (vi) The problems of information transfer from genetic material to RNA templates are most profitably discussed in terms of nucleotide sequences in DNA, but the participation of either RNA or protein in the genetic code cannot be excluded. (vii) Information specifying both the primary and tertiary structures of proteins is coded in that part of the genetic material called euchromatin. The integrated units of this code need not be coextensive with the units of genetic recombination, and interactions between such units may occur either in the formation of RNA templates or at the level of template activity. (viii) Heterochromatin contains information restricted to the determination of aspects of tertiary structure not specified by amino acid sequence. Alterations in heterochromatin, therefore, are less likely to result in changes in the specificity of proteins and more likely to result in changes in purely physical properties."

977 Cohen, G. & Jacob, F.
Sur la répression de la synthèse des enzymes intervenant dans la formation du tryptophane chez *Escherichia coli.*
(On the repression of the synthesis of the enzymes concerned in tryptophane formation in *E. coli*).
CR Acad. Sci., Paris 1959 : **248** : 3490–92.

In the wild type of *E. coli* K12 ($R_1{}^{+}{}_{\mathrm{try}}$), the addition of trytophane to the cultural medium inhibited the synthesis of several enzymes concerned in tryptophane production, but a mutant carrying $R_1{}^{-}{}_{\mathrm{try}}$, which apparently lies at a considerable distance from the determinants governing the synthesis of the tryptophane enzymes, was not or hardly repressed by tryptophane. In a cross between Hfr $R_1{}^{-}{}_{\mathrm{try}}$ and F$^-$ $R_1{}^{+}{}_{\mathrm{try}}$, the heterozygotes were of the wild type and the $R_1{}^{-}{}_{\mathrm{try}}$ character was expressed only after further segregation.

978 Englesberg, E. & Killeen, N. L.
Mixed gene loci controlling L-arabinose isomerase and L-ribulokinase activities in *Escherichia coli* B/r.
Genetics 1959 : **44** : 508–09. (Abst.).

Gross *et al.* have shown that 17 ara$^-$ mutants fall into three functional groups (A,B and C) on the basis of sensitivity or resistance to arabinose inhibition, accumulation of large quantities of ribulose and abortive-transduction tests. The order of these mutants was determined by transduction experiments, using three and four-factor "reciprocal" crosses between the various ara$^-$ mutants, with leucine (*leu*) and threonine (*thr*) independence as nonselective markers. All 17 mutations proved to be closely linked and in linear array, with each functional group corresponding precisely to a closely linked genetic group. The groups were arranged in the order *thr*, *araA*, *araB*, *araC*, *leu*. Quantitative enzymatic analysis of extracts revealed the following. Each mutant in group A was deficient in arabinose isomerase, which catalyses the conversion of arabinose to ribulose. All mutants in group B were deficient in ribulocinase, which catalyses the phosphorylation of ribulose to ribulose phosphate. This group was mixed, however, in that its members differed in arabinose isomerase activity, ranging from one-tenth to four times that of the prototroph. No relationship was detected between these differences in isomerase activity and the order of the mutations. All C mutants were deficient in both cinase and isomerase.

979 Englesberg, E.
Glucose inhibition and the diauxie phenomenon.
Proc. nat. Acad. Sci. USA 1959 : **45** : 1494–507.

Salmonella typhimurium 'LT2' ($C^{+}dg^{5}$) gives rise to spontaneous mutants ($C^{-}dg^{5}$) unable to utilize glucose and other carbohydrates, glycerol or pyruvate as sole sources of carbon although remaining similar to the parent strain in capacity to utilize various Krebs-cycle compounds. Although the mutants grow well in a mineral citrate medium, addition of glucose severely inhibits growth and glucose-resistant mutants (C^-dg^{r-1}) may be isolated which are still unable to use glucose, glycerol or pyruvate. Conversion of C^-dg^{r-1} bacteria to C^+dg^{r-1} was effected by transduction. Evidence was obtained that the cause of the glucose inhibition lay in an alteration in the glucose-citrate diauxie of the wild type and that mutation to glucose resistance is actually mutation to resistance to this effect. The marker dg^{r-1} in an otherwise wild-type genetic background acts as a modifier, resulting in reduction of the growth rate specifically with glucose as substrate and a two or three-fold increase in the activity of an acid phosphatase. This increased activity may be considered as affecting the functioning of genes directly concerned with glucose metabolism.

980 Gross, S. R.

Functional complementarity of leucine mutants of *Neurospora.*

Biol. Bull. 1959 : **117** : p. 414. (Abst.).

Sixty independently occurring mutations at locus *leu*–3 fell into four categories with respect to restoration of enzymatic activity in heterocaryons. Members of group A (31 mutants) did not undergo any restoration with mutants in group B, C or D. Mutants in B (13) were restored when combined with C mutants (14). Group D mutants (2) were restored in combination with some members of B and C. A study of the spatial orientation of the four functional classes within the locus and of the specific structural alterations in enzyme protein is in progress.

981 Fox, A. S., Burnett, J. B. & Fuchs, M. S.

Electrophoretically separable tyrosinases of diverse thermostabilities and their interconversion in *Neurospora crassa.*

Genetics 1959 : **44** : p. 510. (Abst.).

The similarity in specificity and differences in thermostability and electrophoretic mobility of the three components (T_1, T_2 and T_3) of the tyrosinase extracted from homocaryons suggested differences in tertiary structure rather than in active centres. Specificity was probably determined in the earlier stages of synthesis, i.e. at the time of determination of aminoacid sequence or during preliminary folding. Genetic control of the rate of conversion of T_1 and T_2 into T_3, rather than a template mechanism, appeared to be responsible for the preponderance of one or another of the three components.

982 Richter, A. A.

Determinants of mating type in *Escherichia coli.*

Diss. Abstr. 1959 : **19** : LC Card Mic 59–1408 : p. 2724. (Abst.).

“Mating type in *Escherichia coli* is determined by a factor, F, which is fixed to the chromosome in Hfr males, behaves as an infectious particle in F^+ males, and is absent from females. Different Hfr types are determined by the position of the factor on the chromosome.

“A strain is described which changes reversibly at a high rate from a specific Hfr type to the F^+ state. It was found that the determinant of enhanced rate of change is itself the chromosomal site of the factor in the Hfr state. Thus, the movement of the F factor to and away from the chromosome is controlled by the locus to which or away from which the factor moves. This movement may be termed episomic alternation. The determinant of enhanced rate of change may be thought to act by increasing the frequency of events in its neighborhood which allow for the fixation and release of the F factor. Such events may be considered to occur with a low frequency at other chromosomal sites.

“The F factor is shown to undergo reductive infection, a process analogous to lysogenization. In addition, the F factor may transpose from one chromosomal site to a second chromosomal site. This property suggests a relationship between the F factor and the controlling elements of maize. The intrinsic property which these hereditary determinants share is the tendency to undergo a cycle of attachment to and detachment from a chromosomal locus.

“In the second part of the thesis, a tentative linkage map of *Escherichia coli* is presented. In particular, evidence for and against the linkage of Gal to S is presented. This bears on the question of the circularity of the chromosome.”

983 Wikberg, E.

Studies on biochemical mutations in Ophiostoma with special reference to some pyridoxamine-deficient strains.

Svensk bot. Tidksr. 1959 : **53** : 239–56.

Crosses of pyridoxamineless mutants with the wild type indicated that, in addition to the single gene controlling the condition, modifying genes affecting the threshold doses for growth were present. Wild-type mycelia occurring in the progenies of crosses between mutant strains appeared to arise through recombination. This indicates that the genes are nonallelic; they appear to be closely linked however. No support for the view that the mutant genes are complementary was found.

A pyridoxalless mutant derived from one of the pyridoxamineless strains carried both the original mutated gene and a suppressor gene, which by means of appropriate crosses could be transferred to other pyridoxamineless strains.

The bearing of these results on the elucidation of the biosynthesis of pyridoxine is discussed.

984 HOROWITZ, N. H., FLING, M., MACLEOD, H. L. & SUEOKA, N.

Multigenic control of tyrosinase synthesis in *Neurospora*.

Genetics 1959 : **44** : p. 516. (Abst.).

Three unlinked loci have been discovered which function in tyrosinase synthesis. Four alleles determining four structurally different forms of the enzyme occurred at one locus (*T*). Two of the six possible heterocaryons involving these alleles were analysed. No evidence was obtained of interaction between alleles. The other two loci (*ty*–1 and *ty*–2) were characterized by mutants in which tyrosinase synthesis was more or less completely abolished. These mutants carried one or other of the *T* alleles. The tyrosinaseless mutations were recessive to their normal alleles in heterocaryons, the form of the enzyme produced by such heterocaryons being determined by the alleles at *T* brought in by the two parents. Both tyrosinaseless mutants may be induced to produce tyrosinase by growing them in the presence of any one of a number of aromatic aminoacids, the form of the enzyme synthesized corresponding to the allele at *T*. Possibly the secondary roles of *ty*–1 and *ty*–2 may be concerned with regulating the appearance and disappearance of tyrosinase during the life cycle.

985 HIROTA, Y.

Mutants of the F factor in *Escherichia coli* K-12.

Genetics 1959 : **44** : p. 515. (Abst.).

F′ mutants of several Hfr strains were isolated from old broth cultures [cf. 1020]. Each mutant controlled a characteristic pattern of transfer of loci from the chromosome of the ♂ parent in a linkage sequence similar to that of the original Hfr strain from which it was derived. "Like standard F^+ the new F′ can be disinfected by acridine treatment [cf. XXIX, 1002] and passed to other F^- strains. These results suggested that the F′ factor is split off from the Hfr locus and liberated into the cytoplasm. Although free of the chromosomal site, it still determines transfer of the chromosome with high frequency and the point of chromosome breakage, and controls the sequence of oriented transfer of genes of the donor chromosome during conjugation. Its specificity might be from the retention of a chromosome segment of the Hfr parent from which the F′ originates. Double infection as well as mutual exclusion have been observed in combinations of nonidentical F factors."

986 WEINBERG, R.

Gene transfer in one mating type of *Escherichia coli*.

Genetics 1959: **44** : p. 544. (Abst.).

As shown by the work of Jacob and his colleagues, in gene transfer from Hfr to F^- recipients, some markers are transferred at an earlier time than others, and transfer of early markers is seldom accompanied by transfer of later markers while transfer of late markers is usually accompanied by transfer of early markers. This oriented linkage is characterized by decrease in the frequency of transfer of late markers. Jacob and Wollman have postulated the occurrence of a region in which the chromosome breaks while being transferred, markers beyond this region being transferred with low frequency (10^{-4} %). In his investigation of markers situated between the high and low frequency regions, the author found that reduction in frequency of transfer was gradual.

987 CATCHESIDE, D. G.

Segregation in tetraploid potatoes.

Heredity 1959 : **13** : 403–07.

Previous estimates of the amount of double reduction for various loci in tomato and potato have given larger values when the plant was duplex for the locus concerned than when it was simplex. It is now shown that these differences may result from the effects of numerical nondisjunction in which gametes receive one or three of one kind of chromosome.

988 ROMAN, H. & HAWTHORNE, D. C.

Reciprocal *vs.* nonreciprocal recombination in mitotically-dividing cells of yeast.

Genetics 1959 : **44** : p. 531. (Abst.).

A search is being made for evidence concerning reciprocity *v.* nonreciprocity of the recombination event. Recombinations in regions between marked loci are principally reciprocal whereas allelic recombination (gene conversion) is chiefly nonreciprocal. The response of each type of event to ultraviolet radiation is different: the frequency of allelic recombination increases exponentially with dosage but the response of recombination between loci appears to be linear. The evidence favours the hypothesis that the two events are due to different processes [cf. XIX, 3360].

989 Hanson, W. D.

Early generation analysis of lengths of heterozygous chromosome segments around a locus held heterozygous with backcrossing or selfing.

Genetics 1959 : **44** : 833–37.

Fisher [XX, p. 831] obtained an asymptotic value ($2/n$) for the average length of heterozygous segments around a selected locus after n generations of back crossing. This value is adequate after the BC_8 but not for earlier generations. The author therefore derives the exact cumulative distribution for heterozygous half lengths (lengths measured in only one direction from the fixed locus) for any n generations of backcrossing (or selfing) and presents the values for the BC_1–BC_6 (F_2–F_4) in a table.

990 Hanson, W. D.

Theoretical distribution of the initial linkage block lengths intact in the gametes of a population intermated for *n* generations.

Genetics 1959 : **44** : 839–46.

The cumulative distribution for the lengths of linkage blocks remaining intact after n generations in an intermating population is derived. It is presupposed that recombination does not involve a locus heterozygous for a progenitor chromosome type. Values for the proportionate unbroken segment lengths per chromosome are worked out for the F_0–F_{24}. The principal reduction in this value occurs in the F_1–F_5. After the F_8, the asymptotic value $1/n$ (variance $1/n^2$) can be used.

991 Hanson, W. D.

The breakup of initial linkage blocks under selected mating systems.

Genetics 1959 : **44** : 857–68.

Expressions are derived for the average segment length per chromosome in the gametic array of populations derived from an initial cross of p homozygous parents in all possible combinations. The mating systems considered are n successive intermatings and q intermatings followed by selfing till complete homozygosity results. Tables of expected segment lengths are given for each of these treatments for chromosome lengths of 0·5, 1·0 and 2·0, $p = 2, 3, 4, 6, 10$ and ∞, $n = 1$–$6, 8, 10, 16$ and 30, and $q = 0$–9.

992 Maling, B.

The alteration of crossing over in *Neurospora crassa* by analogues by* thymine and phenylalanine.

Genetics 1959 : **44** : p. 525. (Abst.).

Various agents were tested for their effect on crossing over by measuring the frequency of prototrophs from a cross between linked nutritional mutants. The most effective treatments were further tested by analysing ordered asci from a cross in which crossing over could be detected in five intervals in two linkage groups. To obtain accurate estimates of exchange frequencies in gene-centromere intervals, correction was made for ascospore rearrangement attributable to partial overlap of second-division spindles. The treatments significantly increased the frequency of partial overlap. Treatment with p-fluorophenylalanine caused a significant increase in crossing over near a centromere and treatment with 5-bromouracil significant decreases in midarm intervals. Positive chiasma interference occurred in both linkage groups but was stronger in one group than the other. Chiasma interference was not affected by treatment. Negative chromatid interference was highly significant in crosses treated with 5-bromouracil. Possibly the action of the two chemicals depended on the production of abnormal structural components in the chromosomes. Even if this hypothesis were correct, however, these analogues need not be directly involved in crossing over. The fact that the two agents elicit different responses in different regions of the chromosome indicates that they may not act solely by altering the lability of a particular type of chemical bond distributed throughout the chromosome.

993 Stadler, D. R.

The relationship of gene conversion to crossing over in Neurospora.

Proc. nat. Acad. Sci. USA 1959 : **45** : 1625–29.

Stadler, D. R.

The relationship of gene conversion to crossing over in Neurospora.

Genetics 1959 : **44** : p. 538. (Abst.).

Two general types of hypothesis have been suggested regarding the relationship between conversion and crossing over: (1) the two phenomena involve separate events or (2) are the results of the same recombination event. According to (1) it may be predicted that a recombination event detected by either gene conversion or crossing over should have the effects associated with recombination events of any kind. The author has carried out an experiment to study the relationship between conversion and crossing over in a separate but nearby chromosome region.

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* ? of.

"The single event hypothesis might predict interference in all the converts, even those with no recombination for the markers embracing the conversion locus. The separate events hypothesis would predict no interference in this group. Cysteine-independent converts were selected from the cross *lys+ cys–t ylo+ ad* x *lys cys–c ylo ad+*. Crossing over frequencies were: *lys* 4·1 *cys* 19·2 *ylo* 10·7 *ad*. Of 84 converts with non-parental combinations of adjacent markers (*lys+ cys+ ylo* and *lys cys+ ylo+*), one had *ylo–ad* recombination. Of 96 converts with parental combinations of adjacent markers (*lys+ cys+ ylo+* and *lys cys+ ylo*), 16 had recombination in the *ylo–ad* interval. The results suggest that gene conversion and crossing over are separate events."

994 STADLER, D. R.

Gene conversion of cysteine mutants in *Neurospora*.

Genetics 1959 : **44** : 647–55.

Crosses between two cysteine-requiring strains with mutant genes at the same locus or very closely linked loci gave 0·2% cysteine-independent progeny as the result of gene conversion [cf. 993]. Considerable alterations in the recombination frequency for regions adjacent to the locus (*cys*) for cysteine requirement were not accompanied by marked changes in the rate or pattern of gene conversion at this locus. A high coincidence was found between conversion at *cys* and recombination in the marked regions adjacent to this locus. The segment involved in such coincident recombinational events appeared to be shorter than the distance from *cys* to the closest marker on either side. Five crosses between cysteine-requiring mutants were studied in which linked markers on both sides of *cys* were segregating. The relative frequencies of the different combinations of markers accompanying conversion suggested that this process and crossing over were separate events and that the two mutations were at separable loci along the chromosome.

995 HANSON, W. D.

The average length of initial linkage blocks intact after *n* meiotic divisions within selected mating systems.

Genetics 1959 : **44** : 514–15. (Abst.).

"A mating population synthesized by intermating *p* homozygous parents was considered. Thus, *p* homologous chromosome types (progenitor linkage blocks) would be present in the first generation for each homologous set. The average length of progenitor linkage blocks intact after *n* generations of mating involved first the identification of the distribution of chromosome types with respect to the total number of points of genetic recombination which had occurred in *n* meiotic divisions. This distribution was independent of the mating system. Secondly, the distribution of chromosome types with respect to the total number of effective recombinations (recombinations involving loci heterozygous for progenitor chromosome types) was determined, which was a function of the mating system. The average genetic distance, with respect to the true genetic map scale, between any two consecutive points of effective recombinations is the average length of initial linkage block intact after *n* meiotic divisions within a selected mating system. With *p* large the exact distribution of chromosome types and the density distribution for linkage block lengths was derived for a random intermating population. With *p* small in a random intermating population or with inbreeding an approximate distribution of chromosome types with respect to number of effective recombinations was considered which approached the exact distribution as the number of generations became large. The information was used to evaluate the break up of linkage blocks for selected chromosome map lengths under selected mating systems including selfing and selfing from an intermating population. The derivation of average linkage block lengths, as measured with respect to the true genetic map scale, required only the assumption that the occurrence of any two points of genetic recombination was independent in a probability sense. This assumption would not be critical when the total number of points of recombination from *n* meiotic divisions was considered since recombinations occurring in different generations would be independent."

996 WILLIAMS, W.

Heterosis and the genetics of complex characters.

Nature, Lond. 1959 : **184** : 527–30.

It is pointed out that the distinction necessary between gene interaction and the interrelationships of the component parts of the phenotype are usually overlooked in studies of heterosis of complex characters. Phenotypic characters may be multiplicative and may consequently show a mutually dependent relationship while the relevant gene system is strictly additive and its units are strictly independent in function. As shown by (1) an analysis of yield and its components in the tomato made by the author and (2) a reinterpretation of data obtained by Whitehouse *et al.* [cf. XXIX, 291] on inheritance of grain yield and its components in wheat, heterosis in a complex character such as fruit or grain yield may arise in hybrids merely as a result of a reciprocal inequality of independent gene action in the parents. Given reciprocal inequality in the degrees of expression of interacting components in the parents and provided that the degrees of expression in the F_1 balance one another in such a way that their product is greater than in the better parent, heterosis in the complex character in question is inevitable in the hybrids. It is further postulated that multiplicative interaction between adjusted levels of component characters may control the physiological limit of fitness, as suggested by the negative correlation found between number and weight of fruits in the tomato. The phenotype may not be able to sustain the productive capacity potentially residing in the multiplicative relationships between the maximum values for each of the components in the expression of a complex character. When the functional limits are adversely exceeded, physiological breakdown ensues, frequently expressed as sterility, reduced viability or susceptibility to disease. Maladjusted maximum levels of expression in component characters may be responsible for inbreeding depression in outbreeding species, with the result of self elimination of genotypes homozygous for several dominant or hypermorphic alleles. Inbreeding depression, like heterosis, may thus be explained on the basis of interactions between phenotypic components controlled by an essentially additive genetic system.

997 Turner, B. L. & Alston, R.
Segregation and recombination of chemical constituents in a hybrid swarm of *Baptisia laevicaulis* x *B. viridis* and their taxonomic implications.
Amer. J. Bot. 1959 : **46** : 678–86.

A detailed account is given of an investigation which has already been briefly reported [cf. 47].

998 Knobloch, I. W.
A preliminary estimate of the importance of hybridization in speciation.
Bull. Torrey bot. Cl. 1959 : **86** : 296–99.

Prior to giving lists indicating the numerical significance of hybrids between species and higher categories in the plant and animal kingdoms, the author discusses, mainly with reference to plants, problems in the detection of hybrids, crossability in relation to taxonomic status, and the view that hybrids are gradually swamped by their parents in introgression.

999 Benzer, S.
On the topology of the genetic fine structure.
Proc. nat. Acad. Sci. USA 1959 : **45** : 1607–20.

"The topology of the fine structure of a region of the genetic map of phage T4 is investigated by determining whether various mutations do or do not overlap. The results permit representation of the mutations as alterations in a linear structure in which the functional units defined by the *cis-trans* test correspond to unique segments. The possibility of branches within the structure is not necessarily excluded."
[Author's summary].

1000 Jacob, F. & Campbell, A.
Sur le système de répression assurant l'immunité chez les bactéries lysogènes. (**On the repressor system conferring immunity in lysogenic bacteria**).
CR Acad. Sci., Paris 1959 : **248** : 3219–21.

In crosses between lysogenic $(\lambda)^+$ and nonlysogenic $(\lambda)^-$ bacteria, the formation of heterozygotes of $(\lambda)^-$♀ x $(\lambda)^+$♂ resulted in vegetative multiplication of the phage, this being termed zygotic induction, while in the reciprocal the heterozygotes were immune from further infection. Phage multiplication may be induced by ultraviolet irradiation in wild-type λ, but in a noninducible, ultraviolet-induced dominant mutant, *ind*$^-$, this is not possible; in $(\lambda)^-$♀ x (λ *ind*$^-$)$^+$♂ however zygotic induction still occurs. The addition of λ *ind*$^-$ to lysogenic inducible bacteria (λ *ind*$^+$) during the 20 min. following irradiation inhibits phage production and lysis. The surviving fraction of irradiated bacteria then usually still carries λ *ind*$^+$, suggesting that *ind*$^-$ acts by means of a cytoplasmic inhibitor.

The effect of *ind*$^-$ appears to be specific, e.g. it does not affect the immunity associated with temperate phage 434. The mutation appears to have occurred in the C_1 region. Phages of genotype *ind*$^-$ C_1 are not inhibitory, but the recombinants C_1^+ formed by crossing two mutants *ind*$^-$$C_{1A}$ and *ind*$^-$$C_{1B}$ are. It is suggested that the region C_1 of λ phage determines the synthesis of a cytoplasmic element which may be a repressor inhibiting one or more of the reactions necessary for the vegetative multiplication of phages possessing the C_1 region of λ. Irradiation of lysogenic inducible bacteria may be regarded as blocking the production of the repressor while the mutant *ind*$^-$ in some way increases it.

1001 Morse, M. L.
Recombination and segregation in *Gal* heterogenotes showing position effect.
Genetics 1959 : **44** : p. 528. (Abst.).

Heterogenotes between Gal_1^-, Gal_4^-, Gal_6^- and Gal_7^- mutants of *E. coli* were produced. Except for the combination $Gal_4^-Gal_7^-$, heterogenotes had (1) a mutant phenotype in the *trans*-position and (2) wild-type phenotype in the *cis*-position. Both $Gal_4^-Gal_7^-$ *trans*-position heterogenotes had a (+) or intermediate (+) phenotype and both the *cis*-position heterogenotes for this combination were (+). The anomalous behaviour of $Gal_4^-Gal_7^-$ violates the cistron concept. The (—) phenotypic *trans*-position (+ —/— +, — +/+ —) heterogenotes segregated *Gal*$^-$ and in addition underwent automictic recombination to produce (+). The probability per division of segregation from the *trans*-position was $1\text{–}3 \times 10^{-3}$, not significantly different from the probability in non-position-effect heterogenotes. The probability per division in automixis between various pairs of the four mutants (except $Gal_4^-Gal_7^-$) to give (+) is $0{\cdot}3\text{–}5{\cdot}0 \times 10^{-4}$, a value ten times lower than the segregation probability and not significantly different from the rate of meiotic crossing over.

1002 Morse, M. L.
Transduction and transformation.
Ann. NY Acad. Sci. 1957 : **68** : 324–34.

After a brief account of work already summarized [cf. XXVI, 3040 and XXVII, 1046], evidence is adduced indicating that the association of λ phage with the *Gal* genes has produced modifications of λ behaviour, consisting in both the reduction of the multiplication in the vegetative state and the formation of incomplete or defective particles. These defects may be of two types: (1) a defect in the attachment of λ to the chromosome of *Escherichia coli* and (2) a defect such that λ does not mature to plaque-forming particles.

The paper concludes with an outline of transformation through DNA mediation.

1003 Kozinski, A. W. & Szybalski, W.
Dispersive transfer of the parental DNA molecule to the progeny of phage φX-174.
Virology 1959 : **9** : No. 2 : 260–74.

"The fate of the deoxyribonucleic acid (DNA) molecule during its transfer from the parental to progeny phage was studied, employing phage φX–174, which presumably contains one single-stranded DNA molecule. The experimental methods for tracing the parental DNA molecule were based on separation of normal and 5-bromodeoxyuridine (5BU)-labelled viable phage by centrifugation in the CsCl gradient, and on increased sensitivity of 5BU-containing phage to ultraviolet light (UV). When bacteria grown on 5BU-free medium were infected with 5BU-containing ('heavy') phage no 'heavy' phage was detected by CsCl-gradient centrifugation, even among the early phage progeny released by prematurely opened cells. Similarly, no UV-resistant 5BU-free phage could be found among early phage progeny released by 5BU-labelled bacteria infected with 5BU-free phage. The transfer of DNA from the parental to progeny phage amounts to approximately 50%. This transfer could also be inferred from the difference between the slopes of the UV-survival curves for early and for late progeny phage. Whichever experimental approach was used, loss of the integrity of the DNA molecule during its transfer from parental to progeny phage was indicated. The results are best explained on the basis of a *dispersive* mode of DNA replication in phage φX–174. This mechanism would appear to be at variance with the conservative or semiconservative replication of protein-bound, double-stranded DNA observed in other organisms."
[Authors' summary].

1004 Thomas, R.
Effects of chloramphenicol on genetic replication in bacteriophage λ.
Virology 1959 : **9** : 275–89.

"When bacteria are infected in the presence of chloramphenicol with phage λ (virulent h^+) and are then superinfected at various times with a genetically marked phage λ (virulent h), the phage yield obtained by eventual removal of chloramphenicol shows a ratio of genotypes ($h^+ : h$) that is independent of the time interval between the two infections. In the corresponding experiments without chloramphenicol, the stated ratio increases rapidly as the time of superinfection is delayed. The λ chromosome, therefore does not multiply in cultures to which chloramphenicol is added at the time of infection.

"When the addition of chloramphenicol is made some minutes after infection, a slow multiplication of λ chromosomes in the presence of the antibiotic can be detected by the appropriate schedule of superinfections. Moreover, chromosomes of the genotype that prepared the scene for multiplication, and chromosomes of the genotype that entered the cell after chloramphenicol has been added, multiply equally during the period in chloramphenicol. It follows that the preparatory steps in genetic replication that are inhibited by chloramphenicol are the same for phages of *h* and h^+ genotype, contrary to the expectation if one of these steps is a transfer of genetic information."

[Author's summary].

1005 WATANABE, T. & WATANABE, M.

Transduction of streptomycin resistance in *Salmonella typhimurium*.

J. gen. Microbiol. 1959 : **21** : 16–29.

A full account is given of investigations which have already been briefly reported [XXIX, 1129].

1006 WATANABE, T. & WATANABE, M.

Transduction of streptomycin sensitivity into resistant mutants of *Salmonella typhimurium*.

J. gen. Microbiol. 1959 : **21** : 30–39.

The authors present a detailed report of experiments from which they have concluded that first-step intermediate resistance to streptomycin is under the control of multiple loci which are not linked with the locus for indifference (one-step complete resistance) [cf. XXIX, 1129].

1007 KIRCHNER, C. E. J.

The influence of divalent cations on genetic exchange in bacteria.

Diss. Abstr. 1959 : **19** : Publ. No. 21,506 : p. 3086. (Abst.).

Calcium and magnesium cations were removed from bacterial cells either by treatment with the chelating agent ethylenediamine tetraacetic acid or by culture in a minimal medium lacking these ions. When treated F^- cells of *Escherichia coli* were added to F^+ or Hfr cells, an increase in the frequency of recombination was observed; when the parental treatments were reversed, there was no increase. In transduction experiments with *Salmonella typhimurium*, treatment resulted in an increase in prototroph frequency with the recipient strains Try A–8, Try B–2 and Try C–3, and in a decrease with Try D–10. Treating the four recipients with $MnCl_2$ produced an increase only with Try A–8 and Try C–3. Incubation of the treated recipient strains in high concentrations of the divalent ions prior to transduction reversed the effects of treatment, calcium being more effective than magnesium in this respect. Cells of the recipient Try A–8 grown in the absence of divalent cations showed an increase in sensitivity to ultraviolet irradiation, indicating that instability in the genetic material had been produced.

These effects of the removal of divalent cations are similar to those reported for higher organisms and are regarded as indicating a similar genetic structure.

1008 LOUTIT, J. S.

Effect of ultra-violet irradiation on transduction in *Pseudomonas aeruginosa*.

Nature, Lond. 1959: **184**: 1960–61.

Ultraviolet irradiation led to about a 70-fold increase in the transducing ability of filtrate preparations of a strain already referred to [cf. XXVIII. 3671]. The treatment had this effect whether it was applied directly to the filtrate or to the whole culture from which a filtrate was subsequently prepared.

1009 RAVIN, A. W.

The significance of bacterial transformations to studies of the neoplastic process.

Ann. NY Acad. Sci. 1957 : **68** : 335–48.

It is suggested that the hypothesis that neoplasms are clones of mutated somatic cells could be tested if it were possible to replace the mutated genetic material of a neoplastic cell by homologous material from a normal cell and *vice versa*. Conjugation, transduction and transformation in bacteria are in turn considered as means of transference of genetic material. Particular attention is given to transformation, a brief review being provided of work on the penetration of the bacterial cell by external DNA, the possible occurrence of recombination and linkage and the delay in manifestation of the transferred character in the transformed cell. The possibilities of effecting similar transformations in higher organisms are discussed.

1010 EPHRATI-ELIZUR, E. & ZAMENHOF, S.

Incorporation of 5-bromouracil into transforming principle of *Bacillus subtilis* and its biological effects.

Nature, Lond. 1959 : **184** : 472–73.

Earlier investigations on *Escherichia coli* indicated that 5-bromouracil had a mutagenic effect and was incorporated into DNA molecules functioning as determinants of heredity [cf. XXVIII, 2556]. Experiments on *B. subtilis* have demonstrated that DNA containing 5-bromouracil has transforming activity. In the case of transformation from indole dependence to independence, this activity was not significantly affected. In the cases of the other nutritional "markers," the activity was reduced, the degree differing for each marker. Either the activity of each marker was affected differently by the same amount of analogue, or the amount of analogue in each marker was dissimilar.

1011 Schaeffer, P. & Ionesco, H.
Sur la transformation de *Bacillus subtilis.* **(On the transformation of *B. subtilis*).**
CR Acad. Sci., Paris 1959 : **249** : 481–82.

Previous work has suggested that transformation of *B. subtilis* has the following characteristic features: (1) the instability of the transforming DNA; (2) the increase of the specific transforming ability of the DNA in the course of its deproteinization; (3) the supplementary role of RNA in transformation; (4) the need for unidentified substances from yeast extract in the medium; and (5) the restriction of transformation to germinating spores. The first three anomalies may be explained by supposing the DNA preparation to contain a certain amount of bacterial DNase, which is inhibited by RNA; the preparation of DNA sufficiently deproteinized to be resistant to DNase activity is described. The substance from yeast extract is shown to be tryptophane, necessary for the growth of the receptor. Finally, the authors were able to induce transformation whether or not the receptor strain was sporogenous.

1012 St. Lawrence, P.
Gene conversion at the *nic-2* locus of *Neurospora crassa* in crosses between strains with normal chromosomes and a strain carrying a translocation at the locus.
Genetics 1959 : **44** : p. 532. (Abst.).

In the niacin-requiring strain 4540T, a segment of the chromosome of linkage group I is translocated to a subterminal position in the right arm of linkage group III. The parental types and a new class of progeny carrying a duplication of the translocated segment were recovered from crosses of 4540T with stocks having a normal chromosome complement. Segregation of rearranged and normal chromosomes resulted in progeny with 2 : 1 or other aberrant ratios for mutants in linkage groups I and III. From crosses between 4540 strains, however, 1 : 1 ratios of linked markers were obtained. It has not been possible to separate niacin requirement from the rearrangement and it appears likely that the nutritional deficiency was occasioned by a position effect. Failure to secure reversion of 4540T to prototrophy by ultraviolet or X irradiation supported this view. Rare niacin-independent offspring were recovered from crosses of 4540T with strains having non-rearranged alleles at locus *nic*-2. Analysis of segregation of linked markers provided evidence that these exceptions were the result of gene conversion. Since 4540T had a rearrangement affecting *nic*-2, pairing at or near this region must have been interrupted in these crosses. It is therefore suggested that intimate pairing may not be necessary for conversion.

1013 Catcheside, D. G.
Cytoplasmic inheritance.
Nature, Lond. 1959 : **184** : 1012–15.

The author draws attention to the conference on cytoplasmic inheritance organized by B. Ephrussi, held at Gif-sur-Yvette in April 1958, and discusses problems of this type of inheritance against the background of the conference and with reference to literature appearing in the past decade. The criteria and experimental means for the detection of cytoplasmic inheritance received careful consideration at the meeting. Although several or most of the criteria were shown to hold in many individual cases, the author emphasizes that adequate means of recognizing cytoplasmic inheritance *sensu stricto* must still be sought. Examples of supposed extrachromosomal inheritance are broadly classified according to probable mode of determination. It is however pointed out that recognition or denial of the occurrence of cytoplasmic inheritance depends to some extent on the investigator's definition of heredity. "Some would restrict the property of being hereditary to chemical elements which persist permanently in the cytoplasm, in the same way that genes persist in the nucleus. Alternatively, it may be held that any difference in trait which is propagated under effectively the same set of conditions through vegetative or sexual reproduction, or both, is a hereditary difference." It is shown how steady-state systems may be regarded as having attributes of genetic material. The application of Lederberg's distinction of nucleic and epinucleic information is discussed [cf. 57]. In considering the possible mode of integration of genic and extragenic information, it is stated that "Mitchell (unpublished work) has suggested that the cytoplasmic information is carried by the proteins and that these cooperate with ribonucleic acids, carrying the information from the nucleus, in forming ribonucleoprotein templates which direct the formation of enzymes." The writer is of the opinion that such an hypothesis offers a more plausible interpretation than a system of alternative steady states.

1014 Kojima, K.-I.
An analysis of genetic systems in which the phenotype depends upon deviations from an optimum.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–341 : 2722–23. (Abst.).

An optimum model of gene action using heterogeneous optima for different macroenvironments was analysed. In this model, (1) the phenotype exhibits varying levels of dominance, depending on the optimum and gene frequencies, (2) phenotypic effects due to epistasis are nonexistent as long as primary gene action is additive, and (3) the effects of genotype x environment interactions on the phenotype can be expressed as interactions of additive and dominance effects of the primary gene action with the heterogeneous optima.

A new method of partitioning the total variance was devised; it requires that the population mean be written as a function of gene action, partially differentiable with respect to any set of gene frequencies.

Population change due to mass selection was investigated, with special attention to the case where the population is subdivided into small groups, one to each macroenvironment.

It was shown that nontrivial stable equilibria exist for all loci under mass selection.

Covariances between relatives in the same and in different macroenvironments were obtained.

1015 Mandel, S. P. H.
The stability of a multiple allelic system.
Heredity 1959 : **13** : 289–302.

In this mathematical study, the general conditions are calculated under which a system of n alleles at a single locus can be maintained in equilibrium by natural selection in a large random mating population. It is shown that when the population is near such an equilibrium, the mean viability increases with each successive generation. This result is used to obtain sets of conditions which are necessary and sufficient for a polymorphic equilibrium to be stable. One such condition is that the viabilities of the homozygotes are less than the mean viability of the population in the equilibrium state. Stable equilibrium occurs between two alleles only when the heterozygote is more viable than both homozygotes. In the case of three alleles, "it has been shown that at most one heterozygous viability may fall below that of at most two homozygotes."

1016 Novitski, E. & Hanks, G. D.
Use of chromosomes showing meiotic drive in study of population structure.
Science 1959 : **130** : p. 1421. (Abst.).

Any deviation from the equality in the number of A and A' progeny ordinarily produced by an AA' heterozygote will have the immediate effect of altering the allele frequencies in a population. When such a deviation has its origin in an anomaly of the meiotic division, the phenomenon is referred to as meiotic drive. Theoretically, chromosomes or alleles characterized by meiotic drive may not only undergo an increase in frequency themselves but also force into the genome associated neutral or even deleterious genes. The disadvantage thus imposed upon the species must be counteracted by mutation, natural selection or some other means. Work on *Drosophila* has suggested that meiotic drive experimentally introduced into a population offers a useful means of analysing evolutionary processes.

1017 Seyffert, W.
Polyploidie und Populationsstruktur. (**Polyploidy and the structure of a population**).
Ber. dtsch. bot. Ges. 1958 : **71** : p. (10).

Polyploidy was found to have considerable effect on the composition and behaviour of Mendelian populations. Considering a locus with two alleles and assuming unlimited panmixis, a large number of individuals and lack of selection and mutation, it is found that tetrasomics in contrast to disomics do not reach a state of equilibrium immediately after one generation but approach it asymptotically. Double reduction influences both the speed with which equilibrium is approached and the distance of the initial population from equilibrium and this also depends on the distribution of the genotypes in the initial population.

The composition of an equilibrium disomic population depends only on the gene frequency, but for tetrasomics this also depends on the amount of double reduction. For example, with a gene frequency of $p(A) = q(a) = 0{\cdot}5$, the ratio of homozygotes: heterozygotes is 1 : 1 for disomic segregation, 1 : 4·5 for tetrasomic chromatid segregation and 1 : 7 for tetrasomic chromosome segregation. Bilocal tetrasomic populations are, at the beginning, further from equilibrium than comparable unilocal populations but after five or six generations the bilocal populations do not differ significantly from the unilocal. Self-fertile tetrasomics have a very slow decrease in heterozygotes. Calculations involving matrices and determinants showed that the decrease in heterozygotes is a function of double reduction and thus in self-fertile populations the proportion of heterozygotes is determined by the distance of the locus concerned from the centromere. Selection against one of the homozygous genotypes in tetrasomics causes a proportionally greater reduction in the heterozygote decrease than in disomics. The number of generations required for reaching the same degree of inbreeding has been calculated for disomic and chromatid and chromosome tetrasomic segregation without selection.

1018 Jinks, J. L.

Lethal suppressive cytoplasms in aged clones of *Aspergillus glaucus*.

J. gen. Microbiol. 1959 : **21** : 397–409.

An irreversible cessation of growth accompanied by death of the growing hyphal tips and excretion of brown pigment into the medium in the vicinity of the dying hyphae was found to be the result of a mutational change in a cytoplasmic component. In common with other cytoplasmic mutations, that responsible for vegetative death suppressed the wild-type counterpart in cytoplasmic mixtures. The mutant cytoplasm in question was however only capable of survival in mixtures with wild-type cytoplasm. From the aspect of competition, the behaviour of mutant and normal genes in different nuclei in heterocaryons is compared in general with that of mixtures of mutant and wild-type cytoplasms. The view is expressed that, as methods of detecting and recovering cytoplasmic mutations are improved and more examples of unstable heterocaryons analysed, heterocaryotic associations and cytoplasmic mixtures will probably prove to have much closer resemblances than they appear to possess at present.

1019 DeMoss, J. A. & Bonner, D. M.

Studies on normal and genetically altered tryptophan synthetase from *Neurospora crassa*.

Proc. nat. Acad. Sci. USA 1959 : **45** : 1405–12.

Accumulation of indole by mutants td2 and td71 is attributable to an altered tryptophane synthetase which catalyses reaction (3) but not (1) and (2), (1) being indole + serine → tryptophane, (2) indole-3-glycerol phosphate (InGP) + serine → tryptophane + triose phosphate and (3) InGP ⇌ indole + triose phosphate. The wild-type synthetase catalyses all three reactions. While (3) in the wild type does not require pyridoxal phosphate and serine for conversion of InGP, this reaction in td2 requires pyridoxal phosphate and in td71 both pyridoxal phosphate and serine. The two mutants thus represent cases of mutation which have resulted in retention of part of the catalytic function of an enzyme and at the same time imposed new requirements for the reaction retained.

1020 Adelberg, E. A. & Burns, S. N.

A variant sex factor in *Escherichia coli*.

Genetics 1959 : **44** : p. 497. (Abst.).

The view is expressed that the sex factor *F* belongs to the class of determinants termed episomes, which can exist alternately as cytoplasmic particles or as attached chromosomal entities. "The wild type sex factor (F^1) of strain K–12 is characterized by its low affinity for the chromosome and its lack of any preferential site of attachment. The variant sex factor, F^2, arose in Hfr strain P4x, in which F^1 had been stably attached to the chromosome between the loci *prol* (controlling proline synthesis) and *lac* (controlling lactose fermentation). In oriented chromosome transfer by P4x, *prol* is the first marker to be transferred and *lac* is the last; the attached sex factor is linked closely to *lac*. Strain P4x gave rise spontaneously to strain P4x–1, in which the sex factor has acquired two new properties: its attachment to the chromosome is unstable, kinetic studies of zygote formation indicating a rapid alternation between the attached and cytoplasmic states; and it exhibits a high and specific affinity for the site at which F^1 had been fixed. The latter property is recognized by the fact that infection with F^2 converts F^- cells into donors which transfer their chromosome at high frequency and with the same orientation as Hfr strain P4x. It is proposed that F^2 arose by genetic exchange between attached F^1 and chromosome; the incorporation of chromosomal material would explain the high affinity of F^2 for the original site of attachment."

1021 Mandel, P. & Chambon, P.

A new approach to the mechanism of mutations.

Nature, Lond. 1959 : **184** : 1501–02.

Derived from analyses of rat spleen and an ascites hepatoma, data on inhibition of nucleic-acid synthesis by X irradiation have led the authors to postulate that an abnormal molar ratio between RNA precursors (ribonucleoside triphosphates) and DNA precursors (deoxyribonucleoside triphosphates) may result in the production of abnormal DNA and thus induced mutations. Spontaneous mutations may arise as the result of metabolic activity with a preferential effect on the formation of one type of deoxyribonucleoside triphosphate so that the normal ratio of DNA precursors undergoes modification and a modified DNA is synthesized. Finally, it is suggested that viruses, with their pool of DNA precursors, may modify DNA synthesis by the host cells and thus facilitate mutation.

1022 De Giovanni, R. & Zamenhof, S.
The effects of deuterium oxide on *Escherichia coli.*
Genetics 1959 : **44** : p. 505. (Abst.).

The spontaneous rate of mutation for resistance to deuterium oxide was of the order of 10^{-4} and could be increased 300 times by ultraviolet irradiation. Unstable colonial mutants and one unstable auxotroph were induced by the chemical.

1023 Haas, F. L. & Doudney, C. O.
Mutation induction and expression in bacteria.
Proc. nat. Acad. Sci. USA 1959 : **45** : 1620–24.

"(1) UV-induced reversion of an auxotrophic strain of *Escherichia coli* requiring tryptophan involves the postirradiation synthesis of DNA as the final step in the mutation induction process. (2) Mutation *expression* involves the synthesis of protein subsequent to postirradiation DNA synthesis. (3) With an amino acid deficient strain, the fraction of induced reversions capable of phenotypic expression at a given time following induction can be determined by plating identical aliquots of the cells on minimal agar and on minimal agar supplemented with low levels of the required amino acid. (4) It is suggested that this technique may serve as a means for differentiating those processes involved in gene synthesis and mutation from those involved in gene action" [cf. XXIX, 3421]. [Authors' summary].

Comparative clinical and biological effects of alkylating agents.
Ann. NY Acad. Sci. 1958 : **68** : 657–1266.

1024 *Stacey, K. A., Cobb, M., Cousens, S. F. & Alexander, P. The reactions of the "radiomimetic" alkylating agents with macromolecules* in vitro. (*pp. 682–701*).

In this account of the reactions of representative nitrogen mustards, epoxides and esters of methanesulphonic acid with proteins, DNA and nucleoprotein, it is shown that with DNA the most reactive centre is the primary phosphate group. Bifunctional reagents are able to produce cross links in and between macromolecules at low and high concentrations, respectively; in DNA this reaction leads to greater coiling.

1025 *Auerbach, C. Mutagenic effects of alkylating agents.* (*pp. 731–49*).

In this review it is stated that so far there is no evidence that alkylating agents differ in effect or in mechanism of action from other chemical mutagens and that while different chemicals probably act in dissimilar ways, they may not do so according to their chemical grouping. Regarding the mechanism of action, genetic experiments have indicated that alkylating agents do not affect chromosomes by cross linkage, that SH poisoning plays no important role in mustard-gas mutagenesis and that mutagenesis by mustard gas and chromosomal changes by nitrogen mustard do not depend upon oxygen tension. Also, it seems that cell division and high metabolic rate may be essential for optimum effectiveness. It is suggested that, since adenosine triphosphate is involved as an energy donor in the reunion of broken chromosomes, the fact that chromosome breaks induced by mustard gas join up less readily than X-ray-induced breaks may be related to the known sensitivity of phosphocinases to inactivation by mustard gas. There is evidence that mustard gas acts as a hit poison, i.e., acts by discrete chemical micro-events that have a fixed probability of occurring whenever a molecule of the chemical comes in contact with a molecule of the responding biological system. Some differences between chemicals in ability to induce chromosome rearrangements are noted and it is thought that a poor ability may be related to the delay in production of mutations or breaks, which reduces the likelihood of two breaks occurring in the same cell cycle and thus of a rearrangement. It is pointed out that, in experiments on bacteria and moulds in which one of two genes in a nucleus has responded preferentially to one mutagen and the second to another, the mutagenic treatment may also have interfered with some postmutational processes which would give certain mutated genes a better chance than others of becoming established. This would simulate gene-specific mutation .

In the discussion, a paper by O. G. Fahmy and M. J. Fahmy, on mutagenic effects of alkylating agents on *Drosophila*, was read, of which the following is the authors' summary.

"The alkylating agents provide a tool for the induction of mutations as efficient in potency and as wide in range as radiation. The relative mutagenic response during spermatogenesis varies under the effect of different compounds, but is sometimes characteristic of the chemical series. The nature of the mutations induced varies with the agent. A polyfunctional ethyleneimime is as effective in producing chromosome breaks as X-rays, while the mustard derivatives of aminoacids are weak breakers. The alkylating agents induced twice the frequency of small deficiencies as mutagenically equivalent doses of radiation, and this property was independent of the efficiency of the chemical agent in inducing chromosome breaks. The distribution of sex-linked recessive lethals induced by the alkylating compounds is different from that for the same mutations induced by X-rays. Many of the visible mutations induced chemically are different in phenotypic expression and genetic position from those induced by radiation. The tests of mutability at specific visible loci support the principle of differential gene response to various mutagens."

1026 *Koller, P. C. Comparative effects of alkylating agents on cellular morphology.* (*pp. 783–801*).

In studies of the effects of alkylating agents upon *Tradescantia* pollen and experimental tumours in rats, evidence was obtained that the radiomimetic type of injury is directly induced by these agents but that the excessive chromosome fragmentation and breakdown of the mitotic mechanism also observed on using certain compounds may be the result of metabolic disturbances. Inhibition of growth in tumours is caused not only by radiomimetic injuries but also by suppression of mitosis, cell pycnosis in the resting stage and stromal reaction.

1027 *Revell, S. H. A new hypothesis for the interpretation of chromatid aberrations and its relevance to theories for the mode of action of chemical agents.* (*pp. 802–10*).

An outline of the hypothesis referred to in earlier works is presented [cf. XXIV, 1624 and XXVII, 1029].

1028 *Alexander, P. & Stacey, K. A. Comparison of the changes produced by ionizing radiations and by the alkylating agents: evidence for a similar mechanism at the molecular level.* (*pp. 1225–37*).

In vitro experiments indicate that the primary process initiating the cellular damage caused by both irradiation and the alkylating agents is the inactivation of DNA, irradiation acting by producing main-chain breaks, while treatment with polyfunctional alkylating agents produces the same result by effecting either intermolecular or intramolecular cross links. It is suggested that most if not all the differences in biological effect between radiation and the alkylating agents follow from the fact that the latter must diffuse and that some DNA molecules are therefore more accessible than others to the reagent.

1029 PRATT, D. & STENT, G. S.
Mutational heterozygotes in bacteriophages.
Proc. nat. Acad. Sci. USA 1959 : **45** : 1507–15.

Some of the mutants induced by exposing bacteria infected with T4 to 5-bromodeoxyuridine were heterozygotes, giving rise to mixed clones of mutant and nonmutant progeny. The proportion of heterozygotes among the mutants declined with the length of time of exposure to the mutagen. It is suggested that such heterozygosity of the phage particle resides in a double-stranded DNA molecule containing one mutant and one nonmutant polynucleotide chain. Upon subsequent replication, the two complementary chains would separate from each other to give two homozygous daughter molecules, one mutant, the other nonmutant. The reduction in proportion of heterozygotes most probably reflects the continuous segregation of *de novo* heterozygotes into homozygous mutants and nonmutants during vegetative reproduction.

1030 HOLLAENDER, A. & MCCARTHY, A. M.
Mutagenicity in *Aspergillus terreus* of sublethal X-ray doses and its modification by chemical protection.
Science 1959 : **130** : p. 1420. (Abst.).

Irradiation of spores in the presence of cysteamine reduced the number of induced mutations, proof being obtained that the chemical protection was not the result of selective survival or some other phenomenon dependent on spore killing.

1031 LOVELESS, A. & HOWARTH, S.
Mutation of bacteria at high levels of survival by ethyl methane sulphonate.
Nature, Lond. 1959 : **184** : 1780–82.

The induction of reversions of a cystine-requiring mutant of *Salmonella typhimurium*, auxotrophic mutants of *S. typhimurium* and mutations to T6-phage resistance in *Escherichia* *coli* by treatment with the above ethylating agent is reported. The authors draw attention to the value of ethylating agents in research on the nature of mutational processes, on account of their extremely low toxicity. These agents may also prove to be of considerable importance as mutagens in crop breeding and industrial microbiology.

1032 Bawden, F. C.
Effect of nitrous acid on tobacco mosaic virus : mutation or selection?
Nature, Lond. 1959 : **184** : 27–29.

The claim made by Gierer and Mundry [cf. XXIX, 1206] that treatment of tobacco mosaic virus or its isolated nucleic acid with nitrous acid causes mutation is criticized on the grounds that interaction between strains in a mixed initial population offers a more satisfactory basis for explaining their results, evidence from inoculations of Java and other tobaccos with mixtures of tomato aucuba and tobacco mosaic viruses being given in support of this criticism. The possibility of an interaction between virus inactivated by the treatment and active virus also requires to be considered.

1033 Lieb, M.
Factors influencing the postirradiation appearance of mutants in *Escherichia coli*.
Genetics 1959 : **44** : p. 523. (Abst.).

Doses of ultraviolet rays causing little or no killing were used to induce prototrophic mutants of a tryptophane-requiring strain. Frequency of mutants was reduced if protein and DNA syntheses were suppressed immediately after irradiation. Incubation in a complete medium + chloramphenicol, in a medium lacking tryptophane or in saline were all effective methods of reducing mutant frequency. Selection could be excluded as an important factor in the decline in frequency. Most of the prototrophs appeared only after one or two divisions. The occurrence of mutants could be related to DNA and protein synthesis, rather than RNA synthesis. Zero-point mutations seldom accounted for more than 10% of all try^{+} bacteria and were relatively less frequent after doses causing appreciable killing. Irradiation of logarithmically growing cultures produced few if any zero-point mutations. X-ray experiments suggested that the percentage of mutants appearing without intermediate culture was not directly related to the amount of killing due to a given dose but to its effect on mutation and nucleic acid synthesis.

1034 Strauss, B & Okubo, S.
The effect of metabolic processes on mutation induced by alkylating agents.
Genetics 1959 : **44** : p. 540. (Abst.).

A study was made of the effects of different incubation media on number of reversals to prototrophy in a tryptophane-requiring strain of *Escherichia coli* treated with ultraviolet rays, diethyl sulphate or epichlorohydrin. It was concluded that the "premutated state" induced by the alkylating agents did not require immediate protein synthesis for fixation into the genome. The protein synthesis required for the fixation of ultraviolet-induced mutations [cf. XXIX, 3421] may be an effect specific to this mutagen.

1035 Krieg, D. R.
Induced reversion of T4r_{II} mutants by ultraviolet irradiation of extracellular phage.
Virology 1959 : **9** : 215–27.

"Extracellular T4r_{II} phage were exposed to ultraviolet light (UV) prior to multiple infection of unirradiated bacteria. The frequency of r_{II}^{+} revertants was many times greater among the progeny of irradiated phage than among the progeny of unirradiated controls or untreated parental phage. The conclusion is that these results reflect UV-induced reversions. Reconstruction experiments show that there is no preferential survival or growth of r_{II}^{+} phage under these conditions. Observations described in this paper are compatible with the idea that UV irradiation of genes increases the probability of their mutation, even if they are irradiated apart from other cellular constituents. Earlier work with irradiated host cells gave little or no support for this hypothesis."
[Author's summary].

1036 Avakean [Avakjan], A. A.
Natura biologică a himerelor obţinute prin altoire în cadrul speciei. **(The biological nature of chimeras obtained by intraspecific grafting).**
An. Romîno-Soviet. : Ser. Agric.-Zooteh. 1958 : **11** : No. 4 : 38–51.

[Cf. XXVIII, 4804].

1037 Głuszczenko [Gluščenko], I. E.
Rozwój prac nad krzyżowaniem wegetatywnym. **(The progress of work on vegetative hydridization).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1958 : **2** : 1–20.

This is a Polish translation of a Russian paper which has already been abstracted [XXVIII, 3716].

1038 Gluščenko, I. E.
(Some regularities of vegetative hybridization of plants).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1959 : No. 1 : 13–20. [Russian].

[Cf. XXIX, 1154].

1039 Imšeneckij, A. A., Perova, K. Z., Zajceva, T. A. & Belozerskij, A. N.
(The transmission of streptomycin resistance in staphylococci by means of DNA).
Mikrobiologija (Microbiology), Moskva 1959 : **28** : 187–90. [Russian].

A streptomycin-resistant variant of *Staphylococcus aureus* was obtained by culturing the initial strain on a substrate containing streptomycin. By growing susceptible strains on a substrate containing DNA isolated from the resistant variant, mutants were obtained which grew well on a solid streptomycin substrate. The frequency of mutations rose with increase in the DNA content of the substrate.

1040 Ryan, F. J.
(Adaptation mechanism in bacteria. I. Hereditary and nonhereditary adaptation).
Mikrobiologija (Microbiology), Moskva 1958 : **27** : 673–78. [Russian].

Facts emerging from experiments by Benzer, Lederberg, Monod *et al.* are cited in support of the writer's concept of the mechanism of adaptation in bacteria, in the present instance, the adaptation of *Escherichia coli* to ferment lactose. The writer regards adaptation as the outcome of mutual interaction between the hereditary substance and the environment. Two kinds of adaptation are envisaged: (1) where all or most of the cells become adapted, this kind being not heritable; and (2) when the genetic composition of the population changes as a result of selection of mutants.

1041 Šefler [Schäfler], S. & Mincer [Mintzer], L.
(The effect of substrate concentration on fermentation of lactose by salmonellae).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **128** : 830–32. [Russian].

Cellobiose-positive strains of *Salmonella* were cultured upon substrates containing 0·3, 0·6, 1·25, 2·5 and 5% lactose. The number of variants fermenting lactose rose as the concentration of lactose increased.

1042
(General line of progress in Soviet biology).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) : Otdel biol. (Biol. Ser.) 1959 : **64** : No. 2 : 5–10. [Russian].

Mention is made of changes in editorial policy of the above journal which are intended to promote biological research. The principal aims are (1) to combat idealist bourgeois theories, (2) stricter adherence to facts in discussions of such concepts as the species, the origin of species and interspecific relations and (3) dedication of more space to research on practical application of advances in biology, especially to agriculture and medicine.

EVOLUTION

Fifth Annual General Meeting of the Australian Academy of Science.
Aust. J. Sci. 1959 : **22** : 2–48, ix.

1043 *Passmore, J. A. Darwin and the climate of opinion.* (*pp. 8–15*).

The author first shows how Darwin wrote *The Origin of Species* at a time when progressive thought and scientific opinion were ripe for such a work and how Darwin's greatness lay not in "inventing evolution" nor in discovering natural selection but giving evolution the status of a scientific theory. The influence of his theories and methods in psychology, philosophy, religion and other fields is then discussed.

1044 *Fisher, R. A. Natural selection from the genetical standpoint.* (*pp. 16–17*).

Retrospectively commenting on the situation at the fiftieth anniversary of the publication of *The Origin of Species*, the writer argues that, with respect to evolutionary theory, the majority of early geneticists completely misunderstood the significance of Mendel's discovery and their own advances. A plea is made that the understanding of Darwin's theory gained in the middle of this century be retained and not obliterated by the cult of the new.

1045 *Birch, L. C. Darwin and his successors.* (*pp. 17–22*).

An account is given of advances in population genetics and other fields during the past three decades which are regarded as vindicating the hypothesis of evolution by natural selection acting on the raw materials of hereditary variation provided ultimately by mutation.

1046 *Rendel, J. M. Natural and artificial selection.* (*pp.* 22–27).
Various aspects of natural and artificial selection are contrasted and artificial selection experiments on *Drosophila* discussed. These experiments have indicated that genetic variability may accumulate behind a phenotypic invariability, which is manifest in three ways, as dominance, insensitivity to small gene changes accumulated by selection and insensitivity to environmental effects. When, however, a developmental path is pushed sufficiently far from its normal course, it is no longer canalized and the genetic variability then finds expression, whether the force altering development is genetic or environmental. "Thus Darwin's observations on this aspect of genetic variability, that is, on its ability to come and go, receive ample theoretical and experimental support from artificial selection of populations produced by natural selection."

1047 *Frankel, O. H. Variation under domestication.* (*pp.* 27–32).
It is suggested that in the attempt to elucidate adaptation, i.e. the synthesis of variation and selection, Darwin's evolutionary model of domesticated animals and plants may again stand in good stead, since it has many of the advantages of the controlled selection experiment while retaining some of the features of natural selection. Mainly with reference to plants, the author breaks down the nature of adaptation under domestication into its component factors and their interactions, indicates how this adaptation differs from adaptation under natural conditions and suggests possible directions in which further fundamental knowledge and economic improvement may be sought.

1048 *Pryor, L. D. Evolution in eucalyptus.* (*pp.* 45–48, *ix*).
Attention is drawn to the value of *Eucalyptus*, which is virtually confined to Australia, from the point of view of evolutionary studies, and the evolution of the genus is discussed with reference to the fossil record, the pre-Miocene isolation of the south-west of Western Australia from the rest of the continent, the evolution of the behaviour of species belonging to the principal subgenera to grow as codominants in mixed stands without interbreeding, the role of ecological factors in the stability of species in the same interbreeding group, reproductive barriers between species within subgenera, origin of species through introgression and clinal variation within species.

Commemoration of the centennial of the publication of *The Origin of Species* by Charles Darwin. Annual General Meeting of the American Philosophical Society, April, 1959. Proc. Amer. phil. Soc. 1959 : **103** : 159–319, 609–44, 716–25.

The following were among the contributions which were chiefly intended for the non-geneticist and dealt with the influence of Darwin's work in biology, religion and other fields.

1049 *Lerner, I. M. The concept of natural selection: a centennial view.* (*pp.* 173–82).
The aspects discussed include the criticisms which have been levelled against the doctrine of natural selection, the definition of natural selection, various advances in evolutionary knowledge since Darwin and miscellaneous implications of organic evolution.

1050 *Stern, C. Variation and hereditary transmission.* (*pp.* 183–89).
Darwinian view on inheritance and variation are examined in the light of the neo-Darwinian interpretation of evolution, special attention being given to the problems of the specificity of adaptations and the evolution of inherited adaptations.

1051 *Müntzing, A. Darwin's view on variation under domestication in the light of present-day knowledge.* (*pp.* 190–220).
Darwin's views on the influence of the environment, the effects of crossing and inbreeding and other relevant aspects are expounded and assessed with reference to animals and plants. A section reviewing modern information on the origin of crops and some important breeding methods brings out the limitations of Darwin's knowledge concerning the domestication of plants.

1052 *Mayr, E. Isolation as an evolutionary factor.* (*pp.* 221–30).
The progress made during the past hundred years in elucidating the evolutionary role of geographical and reproductive isolation is outlined.

1053 *Stebbins, G. L. The role of hybridization in evolution.* (*pp.* 231–51).
With examples among both plants and animals, the subject is considered with reference to:

sterility of interspecific hybrids; stabilization of hybrid derivatives by amphiploidy and introgression; stabilization of segregates from hybridization; the relation between the environment and outcome of hybridization; and a general hypothesis of the role of hybridization in evolution.

1054 *Dobzhansky, T. Variation and evolution.* (*pp. 252–63*).

Mainly with reference to the population genetics of *Drosophila*, the problem of the mode of origin of the hereditary variation upon which natural selection operates is discussed.

1055 *Newell, N. D. The nature of the fossil record.* (*pp. 264–85*).

Paleozoological and paleobotanical discoveries during the past century are evaluated as evidence of evolution, against the background of paleontological knowledge in the nineteenth century.

1056 *Simpson, G. G. Anatomy and morphology: classification and evolution: 1859 and 1959.* (*pp. 286–306*).

Pre-Darwinian classificatory concepts and the role played by Darwin's views in the development of modern taxonomy are analysed.

1057 *Zirkle, C. Species before Darwin.* (*pp. 636–44*).

The writer traces the development of the species concept prior to the time of Darwin.

1058 RAMSBOTTOM, J.
Conception of evolution.
Nature, Lond. 1959 : **184** : 859–60.

An account is given of the meeting held in Paris on 5 June 1959 by the French National Museum of Natural History to celebrate the 250th anniversary of Buffon's birth, the 150th anniversary of the publication of Lamarck's *Philosophie zoologique* and the centenary of Darwin's *Origin of species.* R. Heim gave an opening discourse, which included a consideration of the period before Buffon. J. Peveteau described the personality of Buffon and his ideas on evolution. J. Ramsbottom contributed a comparative account of the lives and work of Lamarck and Darwin. F. Bourdier dealt with French forerunners of the theory of evolution.

1059 PERRIN, C. J.
Darwinism to-day.
Advanc. Sci. 1959 : **15** : 468–74.

An historical survey of the theory of natural selection and the contributions made to it by the development of Mendelian genetics is presented.

1060 CROW, J. F.
Ionizing radiation and evolution.
Sci. Amer. 1959 : **201** : 138–60.

In this general discussion of the above topic, it is pointed out that the mutation rate is not determined by radiation to any significant extent except perhaps in long-lived organisms. Also radiation does not appear to induce qualitatively unique types of mutation. Hence it is concluded that radiation is probably not an important factor in animal and plant evolution.

1061 PIGOTT, C. D.
Genetics and the origin of species.
Nature, Lond. 1959 : **184** : 587–88.

Summarizing contributions to the symposium in the Botany and Zoology Sections of the recent meeting of the British Association, the writer draws attention to some of the main trends in modern evolutionary thought. In introducing the symposium, J. Heslop-Harrison emphasized that barriers to gene flow within a species are of several types. R. Riley dealt with various aspects of the high frequency of polyploidy in plants, referring particularly to wheat. The nature of soil preference and importance of competition were discussed by C. D. Pigott, who described the manner of elimination of *Vaccinium vitis-idaea* from mixed populations with *V. myrtillus* and occasional hybrids through grazing conditions. The remaining contributions mentioned were concerned primarily with *Drosophila* and other animals.

1062 KUPZOW, A. J. [KUPCOV, A. I.]
Parallelism in the variability of plant species with certain common characters.
Z. Pflanzenz. 1959 : **41** : 313–25.

In its generally accepted form, Vavilov's law of homologous series refers to the parallel variability found in taxonomically related groups. It is now pointed out that parallel variations also occur in species which live under similar ecological conditions but belong to different genera and families. In such cases parallel variation is often observed in characters which are not of taxonomic importance. It is suggested that this parallel variability results from the occurrence of "nomogenetic similar mutations of genotypes with common elements of structure." Such mutations in characters which are of no ecological or economic importance are not under the direct control of selection. However the effects of selection on the original forms predetermine subsequent mutations and direct future evolution even in characters which are of no importance in selection.

1063 RYŽKOV, V. L.
(The differentiation of cytoplasm in the origin of species).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1959 : **20** : No. 1 : 16–22. [Russian].

Research by western and Soviet geneticists on the effects of nuclear and cytoplasmic elements upon heredity is reviewed and discussed in relation to the taxonomic importance of the differences which arise in the cytoplasm in the process of evolution. It is concluded that the divergence of species depends on changes in the nucleus and the cytoplasm and the metabolic exchanges between them.

1064 FREDRICK, J. F.
Comparative evolutionary aspects of polyglucoside synthesizing enzymes.
Physiol. Plant. 1959 : **12** : 511–17.

Two enzymes, apparently the same in different organisms, are responsible for polyglucoside synthesis: phosphorylase, which builds up linear polyglucoside chains by α-1 : 4 linkages, and branching (Q) enzyme, which fragments these chains and rejoins the fragments by α-1 : 6 linkages. It is suggested that there is an evolutionary trend from highly branched to unbranched polyglycosides and that this is brought about by progressive removal of phosphorylase inhibitors of a chelating nature such as aminoacids.

CYTOLOGY

1065 TANDLER, C. J.
An alkali-formaldehyde squash technic for plant cytology and cytochemistry.
Stain Tech. 1959 : **34** : 234–36.

The simple procedure described involves fixation in Carnoy's acetic alcohol, washing in 70% ethyl alcohol and then in water, hardening in 10% formalin for four to six hours and then immersion in 2% sodium hydroxide for 12 hr. at 25–37° C. After further washing with water and acetic acid, the material is stained with acetocarmine or by the Feulgen procedure. Good results have been obtained with maize and other crop plants using this technique.

1066 TAKATS, S. T.
Cytoplasmic incorporation of thymidine during meiosis and premeiosis in *Lilium longiflorum*.
Genetics 1959 : **44** : p. 541. (Abst.).

Tritiated thymidine was incorporated during premeiotic mitosis and during meiosis before prophase and at leptotene and zygotene. At all these stages autoradiographs showed the label in the cytoplasm. The label was tentatively determined to be in DNA and to a small extent in protein. "When no nuclei synthesize nuclear DNA, as during leptotene and zygotene, the cytoplasmic label is at a minimum. It is also very low immediately preceding the meiotic synthesis, when the sporogenous cells stop dividing mitotically. Earlier than this, all cells show considerable cytoplasmic label, although the mitotic index and corresponding percentage of labelled nuclei is *ca.* 3%."

1067 RASCH, E. & WOODARD, J. W.
Basic proteins of plant nuclei during normal and pathological cell growth.
J. biophys. biochem. Cyt. 1959 : **6** : 263–76.

Microphotometric examination of normal somatic and sporogenous nuclei in *Tradescantia*, *Lilium*, *Rhoeo*, *Vicia faba*, onion and maize revealed a stable quantitative correlation between DNA and histones. In the nuclei of crown-gall tumour tissues of *V. faba*, alterations in DNA content were accompanied by quantitatively similar changes in histone content so that the DNA/histone ratios found in nuclei of the corresponding normal tissues were maintained. The possibility that histones play an indirect role in the transmission of genetic specificities is briefly considered.

1068 MCLEISH, J.
Comparative microphotometric studies of DNA and arginine in plant nuclei.
Chromosoma 1959 : **10** : 686–710.

Photometric analysis of nuclei of *Tradescantia ohioensis* (2*x*, 4*x*), *Ranunculus ficaria* (2*x*, 3*x*, 4*x*), *Scilla campanulata*, *Vicia faba* and *Allium cepa* by means of the Feulgen and Sakaguchi reactions indicated that (1) nuclear arginine has a quantitative constancy which parallels that of DNA, (2) the amount of nuclear arginine, like that of DNA, is doubled during interphase, (3) the syntheses of DNA and arginine in interphase, if not simultaneous, at least occur within the same relatively short period, and (4) the nuclei of meristematic and differentiating cells may differ in DNA/arginine ratio.

1069. WU, S. H.
Intercellular migration of nucleus in somatic tissues.
Sci. sin. 1959 : **8** : 853–71.
[Cf. XXVIII, 3745].

1070 Pelling, G.

Chromosomal synthesis of ribonucleic acid as shown by incorporation of uridine labelled with tritium.

Nature, Lond. 1959 : **184** : 655–56.

Experiments on salivary-gland chromosomes of *Chironomus tentans* revealed that (1) the nucleolar RNA was synthesized by the nucleolar organizers only and (2) many other chromosomal sites were also involved in RNA synthesis, although the greater proportion of the RNA was produced at a few very active sites. Tests with radioactive aminoacids provided no evidence of a correlation between protein synthesis and RNA synthesis.

1071 Jørgensen, C. A., Sørensen, T. & Westergaard, M.

The flowering plants of Greenland. A taxonomical and cytological study.

Biol. Skr. 1958 : **9** : No. **4** : 1–172.

A list of the flowering plants of Greenland with comments on their cytotaxonomy is presented, together with a table of chromosome counts and basic numbers for a large proportion of the species. A number of genera in which closely related species have different basic numbers are noted and lists are also given of species in which intraspecific polyploidy is found and of those in which apomixis appears to occur. The percentage of polyploids in the monocotyledons, exclusive of the Cyperaceae, is 84 without the apomicts and 86 including them, while for the dicotyledons the corresponding figures are 54 and 62.

1072 Lamoure, D.

L'hétérocaryose des diplontes d'origine monosporique d'un Basidiomycète amphithalle démontrée par le "phénomène de Buller." (**The heterocaryosis of diplonts of monosporic origin in an amphithallic Basidiomycete, demonstrated by means of the Buller phenomenon**).

CR Acad. Sci., Paris 1959 : **248** : 3479–80.

It is shown that *Marasmius limosus* is tetrapolar. Also, the use of mycelia with known genetic factors in demonstrating the Buller phenomenon, which consists in the diploidization of a haploid mycelium, showed that diplonts of monosporic origin are of two types in the same fruit body, indicating indirectly that diploid monospores are heterocaryotic. The results also suggest that the Buller phenomenon involves the disruption of the dicaryon of the diploid monospore through the participation of one of its nuclei in the formation of the dicaryon of the new diplont.

1073 DeLamater, E. D.

Observations on the organization of the isolated bacterial chromosome.

Genetics 1959 : **44** : p. 505. (Abst.).

Following treatment with sodium glycocholate, nuclei of *Bacillus megaterium* were isolated. Chemical and cytochemical analyses indicated that the isolated structures contained DNA, RNA and protein. By means of the electron microscope (Philips Em–75), chromatid pairing at prophase and metaphase was studied and "what appears to be the chromosome number" determined. "Exposure of isolated chromosomes to phosphate buffer, following graded periods of sonication, causes progressive disruption of the integrity of the nuclear and chromosomal structure, causing the chromosomes to appear ragged or tattered. Using the RCA EMU III–D electron microscope at low power, a comparable picture to that observed with the Philips Em–75 is obtained; with higher magnification, after short exposure to sonication, the individual chromosomes appear to be composite multistranded structures in which longitudinal beading can be observed. With increasing periods of sonication, the structures are progressively disrupted, further suggesting that the chromosomes are made up of multiple longitudinal strands of perhaps relatively short length held in pole-to-pole arrangement. In material that has been more completely disrupted, a longitudinal stranded structure is visible, with associated delicate cross fibrils and granules which approximate the size of RNA molecules."

1074 Srinivasachar, D.

Nuclear deoxyribonucleic acid content and endopolyploidy in the meristem of onion roots.

Nature, Lond., 1959 : **184** : 80–1.

Observations are reported which led the author to conclude that, in the central rows of cells in the meristem, mitotic activity ceases and endopolyploidy occurs instead, the DNA content rising to 8C or even 16C. An exceptional prophase nucleus found in a central row had the diploid number of chromosomes, each with four instead of two chromatids. It had a DNA value of 8C.

1075 Nasatir, M. & Stern, H.
Changes in the activities of aldolase and of D-glyceraldehyde-3-phosphate dehydrogenase during the mitotic cycle in microspores of *Lilium longiflorum.*
J. biophys. biochem. Cyt. 1959 : **6** : 189–92.

Mitosis occurred during the period of minimum activity of both aldolase and glyceraldehyde-3-phosphate dehydrogenase, thus indicating that increased glycolytic capacity is not necessarily related to mitosis. The soluble-sulphydryl concentration was highest when the enzymes were least active.

1076 Hill, R. B. (Jun.), Bensch, K. G. & King, D. W.
Unimpaired mitosis in cells with modified deoxyribonucleic acid.
Nature, Lond., 1959 : **184** : 1429–30.

Accepting the hypothesis that acridine orange becomes attached to DNA and thus causes loss of "spatial integrity" of the DNA molecule, the authors interpret their observations on fibroblasts as providing evidence that such a change does not result in alterations in cell division, DNA replication or protein synthesis.

1077 Milovidov, P.
Orientierende Versuche über den Einfluss von Mutterkornpilz-Alkaloiden auf die pflanzliche Zelle. (**Orientating experiments on the influence of ergot alkaloids on the plant cell**).
Planta 1959 : **54** : 172–94.

The effects are described of treating *Vicia faba* root cells with ergotamine tartrate, ergotamine bitartrate and ergotoxin tartrate solutions applied at varying concentrations for different periods of time. Both alkaloids acted similarly as mitotic poisons; fusion of nuclei resulting in polyploidy, distribution of chromosomes throughout the cytoplasm and pycnoses were some of the effects observed.

1078 Barthelmess, A. & Einlechner, J.
Chemisch induzierte multipolare Mitosen. II. (**Chemically induced multipolar mitoses. II**).
Protoplasma 1959 : **51** : 325–37.

Root tips of *Allium cepa* were treated for four hours with aqueous solutions of primary saturated aliphatic alcohols, glycols, glycol ethers, ethyl ether and acetone. All these substances produced merocinetic effets in varying degrees [cf. XXVIII, 85].

1079 Wilson, G. B.
Fourth Huskins memorial lecture: studies on the control of mitotic activity.
Canad. J. Genet. Cyt. 1959 : **1** : No. 1 : 1–9.

In his address to the Genetics Society of Canada, the writer discussed (1) the findings of a quantitative approach to the study of active mitosis based on the analysis of the effects of colchicine, actidione and iodoacetic acid [cf. XXIX, 1251], and (2) the main findings of research that he and his colleagues have recently undertaken to determine the conditions necessary for the initiation of mitotic activity [cf. 83].

1080 Venema, G.
The influence of substance extracted from cigarette-smoke on mitotic processes in *Allium cepa.*
Chromosoma 1959 : **10** : 679–85.

[Cf. XXIX, 3474].

1081 McManus, M. A.
Certain effects on mitosis in the root tip of *Allium cepa* following application of kinetin and gibberellic acid alone and in combination with indoleacetic acid and maleic hydrazide.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–911 : 2728–29. (Abst.).

McManus, M. A.
Certain mitotic effects of kinetin, gibberellic acid, indoleacetic acid, and maleic hydrazide on the root of *Allium cepa.*
Nature, Lond. 1960 : **185** : 44–45.

Mitosis was usually inhibited by treatment with solutions of the above substances at various concentrations, in various combinations and for various times. Maleic hydrazide induced aberrations such as fragments, anaphase laggards and bridges and beaded chromosomes.

1082 Truhaut, R. & Deysson, G.
Étude de l'activité antimitotique de la N.N-bis (β-chloroéthyl) *p*. aminophénylalanine (formes L et DL) sur les cellules méristématiques d'*Allium sativum* L. (**Study of the antimitotic activity of L and DL forms of N,N-bis (β-chloroethyl)p-aminophenylalanine on the meristematic cells of *A. sativum* L.**)
CR Soc. Biol., Paris 1959 : **153** : 1126–29.

At concentrations above $3{\cdot}28 \times 10^{-7}$M., treatment with the DL form for 24 hr. was lethal;

at 1·64 × 10^{-7}M., a mitodepressive effect was observed; and at 3·28 × 10^{-8}M. no effect was detected. The L form was appreciably less toxic.

1083 NATARAJAN, A. T. & SWAMINATHAN, M. S.
Indirect effects of radiation and chromosome breakage.
Indian J. Genet. 1958 : **18** : 220–23.

Chromosome and chromatid breaks at metaphase and bridges at anaphase were observed in root tips from onion bulbs treated with distilled water, X irradiated with 6600 r., and in root tips of *Triticum monococcum*, *T. dicoccum* and *T. aestivum* plants which had germinated in water irradiated with 33,000 r., the water having been changed four times during the treatment. Mitoses were normal in control material grown in untreated media. Excised embryos of *T. monococcum* and *T. dicoccum* were cultured in White's medium which had been irradiated with 33,000 r. and chromosome and chromatid breaks were again observed during mitosis in root tips; embryos grown in normal White's media showed some chromosome stickiness but no other abnormalities. It is thought that the breaks observed were induced by free radicals released from the media by the radiation. There was some indication that, for a given dose of radiation, there is a decrease in sensitivity with increasing ploidy.

1084 BEATTY, A. V. & BEATTY, J. W.
Postirradiation modification of chromosomal aberration yield.
Genetics 1959 : **44** : p. 500. (Abst.).

In X-ray experiments with *Tradescantia* microspores at 30° C. and a dose rate of 50 r./min., material given 200 r. in air and posttreatment in air for 15 min. yielded 0·23 aberrations per cell. With posttreatments in helium for 15 and 60 min., the aberrations per cell numbered 0·30 and 0·40 respectively. Applying a total dose of 400 r. in air, the frequencies of aberrations obtained with posttreatment in air for 15 min. and in helium for 60 min. were respectively 0·79 and 0·98. At 40° C. and 50 r./min., material subjected to 200 r. and posttreated in helium for 15 min. contained 0·20 aberrations per cell, but posttreatment in air for 15 min. resulted in only 0·11. With a total dose of 400 r., posttreatment in helium for 15 min. induced 0·66 aberrations and posttreatment in air 0·26. These effects of treatment after X irradiation may be explained in terms of energy supply. Similar experimental procedures, combined with fractionated doses, gave results which however indicated that the time of rejoining of X-ray-induced breaks was the same whether irradiation took place in helium or an oxygenated atmosphere.

1085 DUBININ, N. P., SIDOROV, B. N. & SOKOLOV, N. N.
(The mechanism of defence from the genetic effects of radiation).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **126** : 400–03. [Russian].

In studies of chromosomal aberrations in the roots of *Allium cepa* caused by (1) photodynamic action using rivanol, or (2) X rays, $Na_2S_2O_3$ was found to have a strong protective effect against (1) but not (2). Various other chemicals which suppress luminescence acted in different ways, some, e.g., KI, protecting the chromosomes against photodynamic action while others, such as KBr, were only protective against the mutagenic effects of X rays. In another series of experiments, chromosomal aberrations caused by (1) photodynamic action, (2) X rays and (3) aging of the seed were studied in *A. cepa* and *Nigella damascena*. These experiments showed that *Nigella* had a higher degree of resistance than onion to photodynamic action, X rays and the biochemical effects of aging. Spontaneous mutations observed in fresh seed of *Nigella* also occurred less frequently than in fresh onion seed. The superior resistance of *Nigella* to different kinds of mutagenic action is attributed to the presence either of particular chemical substances or of a particular physicochemical state which provide a defence mechanism against different kinds of mutagens.

1086 LA CHANCE L. E.
The enhancement of chromosome aberrations by CO_2 and its dependence on the linear energy transfer of various radiations.
Genetics 1959 : **44** : p. 521. (Abst.).

Tradescantia inflorescences were exposed to fission neutrons (0·5–2·5 Mev) and to monoenergetic 15 Mev neutrons in air and air + 1 atm. of CO_2. With a 10 min. exposure to 15 Mev neutrons (estimated 100 rads), chromosome interchanges increased 17% and interstitial deletions 25% when the treatment was applied in air + CO_2. Only the latter increase was however highly significant. With a 2-min. exposure to fission neutrons (estimated 50 rads), no significant differences were found between material irradiated in air and air + CO_2 with respect to frequencies of interchanges and interstitial deletions. Previous investigations have shown that, with 300 r. of 250 KVP X rays, the frequencies of interchanges and interstitial deletions increased 132% and 245% respectively, when the treatment was given in air + CO_2. The results indicate that the CO_2 effect appears only with radiations having a low LET value. Since broken chromosomes may undergo movement in forming aberrations, it is suggested that CO_2 promotes movement of breakage ends and favours rejoining and that it is most effective when a large proportion of the breaks result from separate tracks. In the case of radiations high in LET value, when two breaks result from one track, chromosome movement becomes of less significance and the CO_2 effect disappears.

1087 Angulo Carpio, M. D.
Acción de agentes físicos en citogenética. (Notas bibliográficas). V. **(Action of physical agents in cytogenetics. (Bibliographical notes). V.**
Genet. iber. 1959 : **11** : 113–28.

A list of references is given, arranged under the headings: X rays, X rays combined with other radiations, X rays combined with other agents, other types of radiation and physical and chemical agents combined [cf. XXIX, 2207].

1088 Angulo Carpio, M. D.
Acción de agentes químicos en citogenética. (Notas bibliográficas). III. **(Action of chemical agents in cytogenetics (Bibliographical notes). III.**
Genet. iber. 1959 : **11** : 99–111.

The bibliography presented is arranged under the headings: colchicine, colchicine derivatives, colchicine together with other substances, purine derivatives, diazine derivatives, substances other than alkaloids, specifically mutagenic substances and other active substances. [Cf. XXIX, 2210].

1089 Kihlman, B. A.
Studies on the production of chromosomal aberrations by visible light: the effects of cupferron, nitric oxide and wavelength.
Exp. Cell Res. 1959 : **17** : 590–93.

Vicia faba root tips were pretreated with acridine orange [cf. XXIX, 2257] before being exposed to light in the absence of oxygen for varying periods; the root tips were also treated with four other chemicals. Nitric oxide and cupferron were effective in producing chromosome aberrations; 23–27μM NO had a greater effect than 400 μM cupferron. Potassium cyanide and ethylenediamine tetraacetic acid were inactive in this respect. In the absence of light, NO and cupferron had no significant effect. Only the light absorbed by the acridine orange produced chromosome aberrations.

1090 Sharma, A.
Tumour production in plants by plant extracts.
Nature, Lond. 1959 : **184** : 1083–84.

Treatment of onion roots with bark extract of *Alstonia scholaris* induced tumours in which the cells were extremely elongated. Most of the cells were at the resting stage, divisions being noted in only 8–10%. Irregularities such as chromosome fragmentation, lagging and stickiness were frequent. Polyploid numbers were found in 2–3% of the cells.

1091 Dubinin, N. P., Sidorov, B. N. & Sokolov, N. N.
(The genetic effect of free radicals).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **128** : 172–75. [Russian].

Research dealing with direct and indirect effects of radiation upon genetic material, with special reference to effects produced by the free radicals OH and HO_2 upon living cells, is discussed. Though the action of OH and HO_2 upon cell nuclei has formed the basis of concepts of the indirect action of radiation, it is claimed that the first experimental proof of this is provided by the experiments referred to below. Germinating seed of *Allium* was soaked in solutions of (1) $FeSO_4$ first and then H_2O_2 and (2) ascorbic acid first and H_2O_2 afterwards. In this way the effects of OH and HO_2 upon the cell nuclei could be studied. Structural changes in the chromosomes of the rootlet cells were obtained, in particular a high incidence of chromosome and chromatid bridge formation and fragmentation at first anaphase and telophase.

1092 Kihlman, B. A.
Effect of nitric oxide on the production of chromosomal aberrations by X-rays.
Exp. Cell Res. 1959 : **17** : 588–90.

In a series of experiments on root tips of *Vicia faba*, 108 r. of X rays was applied together with nitric oxide at concentrations of 2 to 50 μM at 22° C. The production of chromosome aberrations was considerably enhanced at a concentration of 2 μM NO, and 20 μM NO gave maximum enhancement. Nitric oxide appeared to be very similar to oxygen as regards its ablity to enhance the effect of X rays.

1093 SHARMA, A. K. & GUPTA, A.
Chromosome breakage with plant pigments.
Nature, Lond. 1959 : **184** : p. 1821.

Pigment extracts from soil algae representing the Xanthophyceae, Chlorophyceae and Cyanophyceae and from the Solanaceous plant *Cestrum nocturnum* all induced chromosome breakage in root tips of *Allium cepa*, the frequency being particularly high as the result of treatment with Chlorophycean extracts. The latter also induced polyploidy, multipolarity, somatic reduction and a multinucleate condition. Attention is drawn to the possible significance of these findings in accounting for spontaneous mutation.

1094 MOH, C. C. & WITHROW, R. B.
Nonionizing radiant energy as an agent in altering the incidence of X-ray-induced chromatid aberrations. III. Action spectrum of far-red potentiation.
Radiation Res. 1959 : **11** : No. 1 : 18–23.

Radiant energy in the region from 760 to 780 $m\mu$ was found to be most effective in increasing the frequency of X-ray-induced chromatid aberrations in *Vicia* root tips. An irradiance of 200 $\mu w/cm.^2$ is probably the threshold for the induction of potentiation in *Vicia*. [Cf. XXVII, 3723].

1095 MERZ, T., COHN, N. S. & SWANSON, C. P.
The interaction of localized and randomized chromatid breaks produced by treatment with X-rays and radiomimetic compounds.
Genetics 1959 : **44** : p. 527. (Abst.).

Two types of experiment were carried out on *Vicia faba* to determine whether breaks induced by one agent would interact with those caused by another. In the first type, use was made of agents producing breaks in frequencies undiminished by metabolic inhibitors, such as DNP. Since these inhibitors prevent restitution, all breaks induced by one agent should be available for interaction with those induced by another. By means of this method, the interaction of breaks resulting from KCN and X-ray treatments were analysed, breaks caused by the former agent being localized in the heterochromatic regions and those induced by the latter randomized. Exchange frequencies were indicative of complete interaction between breaks. In the second type of experiment, frequencies of breakage produced by treatment with one or both agents were diminished by metabolic inhibitors and treatment by both agents resulted in characteristic breakage in specific regions, as in the case of 8-ethoxycaffeine and maleic hydrazide. Exchanges between breaks in different specific regions indicated interaction and qualitative similarity, and their absence lack of interaction and qualitative disparities.

1096 FRÖST, S.
Studies on accessory chromosomes in some plant species.
Diss. Lund Univ. 1959 : Pp. 9.

The species investigated were *Centaurea scabiosa*, *Plantago serraria* and, to a lesser extent, *Crepis pannonica* and *C. conyzaefolia*. Accessory chromosomes of several types were found. These were well differentiated from the ordinary chromosomes so that, if they are assumed to be derived from ordinary chromosomes, they must be of ancient origin. The fact that in each species there is usually only one main type having a very wide geographical distribution tends to support the ancient-origin view, as does their specialized cytological behaviour.

There are slight indications that plants with and without accessories may have different selective values under different environmental conditions. In *C. scabiosa* there is usually a small loss in accessory chromsomes from one generation to the next, but the very high frequency of accessories found in this species in south-eastern Sweden and Finland suggests that accessories are useful at least under certain conditions, although how far their usefulness is related to their number is not clear.

1097 ŠČERBAKOV, V. K.
(A conference on polyploidy in plants).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **128** : 151–54. [Russian].

A report on a conference held at the Moscow Society of Naturalists in June 1958, together with the titles of 36 papers and the names of their authors, is presented. The opening address was delivered by Astaurov who outlined the general biological importance of polyploidy. Ryžkov, Breslavec, Matveeva and Baranov spoke on general theoretical questions of polyploidy; Baranov also referred to polyploidy studies as providing further evidence of the validity of the chromosome theory. Poddubnaja-Arnol'di and Admiral'skaja dealt with the embryology of polyploids of some economic plants and Zahar'eva and Lipaeva discussed polyploidy in relation to ontogeny. Ščerbakov spoke on the methods of inducing polyploidy, Sokolovskaja on relations between the chromosome number and the size of pollen grains in wild plant species, while Perlova, Strelkova and Sokolovskaja dealt with the question of geographical distribution of polyploids in nature. Saharov spoke on the "physiological defence" of polyploids against ionizing radiation and the differences in resistance between polyploid and diploid forms to other external agents. Mirjuta discussed polyploidy as a means of maintaining heterosis in hybrid progenies of self-pollinating or vegetatively reproduced plants. Polyploidy in wheat or wheat hybrids and related topics, such as the origin and evolution of wheat and the breeding of wheats with 56 and 70 chromosomes or resistant to low temperatures and *Puccinia* were the subjects of addresses by Menabde, Žebrak, Sorokina and Bondarenko. Practical results in breeding polyploids of *Panicum* millet were reported by Zankina and Afanas'eva. D'jakova and Sal'nikov spoke on polyploid buckwheat, the latter mentioning tetraploids said to have been obtained by grafting. Bukasov, Perlova, Čuksanova and Lebedeva discussed various aspects of polyploidy in potatoes, including the systematics of *Solanum* species and the utilization of polyploids arising spontaneously in resistance breeding. Ternovskij submitted a paper on his results in breeding polyploid forms of tobacco for immunity to tobacco mosaic and mildew. Atabekova mentioned systematic studies of the polyploid series in *Lupinus*; Marčenko described cytological investigations of hybrids between sunflower and the Jerusalem artichoke and outlined a theory on the origin of the genus *Helianthus*. Lutkov, Andreev, Berezina and Saharov mentioned results of breeding polyploid forms of medicinal and essential-oil plants of greater economic value than the diploid forms. Žironkin reported the experimental production of polyploids of red currant - black currant hybrids and the occurrence among these of forms with 8, 16, 24 and 32 chromosomes. Haritonova discussed the doubling of the chromosome number as a method of restoring fertility to sour cherry - sweet cherry hybrids and Mackevič spoke on the role of polyploidy in breeding forest trees.

1098 Modilevs'kyj, Ja. S.
(Polyploidy and evolution of the wild and cultivated flora).
Ukrajin. bot. Ž. (Ukrain. J. Bot.) 1959 : **16** : No. 1 : 3–19. [Ukrainian].

The evolution of wild and cultivated plants is discussed in general terms, distinctions in evolutionary significance and breeding value between autopolyploids and amphidiploids being emphasized, those of amphidiploids being rated higher in both respects. The author warns against a hasty announcement of a new species when inducing polyploidy experimentally as the new characters of a polyploidy may be only of a pathological kind. The morphological, physiological and biochemical differences which are observed between polyploids and their initial forms are attributed to a shift in the metabolism of the protoplast as a whole and the characters of a polyploid are thought not to depend only on the microstructure of the chromatin elements of the nucleus. Hence, the chromosome number alone does not determine the biological nature of an organism.

GENERAL BOTANY

1099 Raper, J. R.
Sexual versatility and evolutionary processes in fungi.
Mycologia 1959 : **51** : 107–24.

Sexual phenomena in various fungal groups are discussed; it is concluded that the fungi constitute an evolutionary cul-de-sac when judged solely by sexual characters and that the evolution of sexual processes has paralleled the morphological and physiological divergences which produced the major groups. More detailed knowledge of sexuality in the fungi is essential for an interpretation of their evolution.

1100 Čajlahjan, M. H.
(The active forces of development in plant organisms).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.): Otdel biol. (Biol. Ser.) 1959 : **64** : 61–77. [Russian].

The forces operative in ontogeny and phylogeny are reviewed from the viewpoint of dialectical materialism. In the writer's view these forces are brought about by dialectical contradictions within the organism. Anabolism and catabolism, physiological and morphological interactions, senescence and rejuvenation, vegetative growth and regeneration, and heredity and variability are referred to as the principal conflicting forces. To become operative they are said to require a definite kind of environment, which is regarded as the most important single factor in gradually changing the heritable basis of an organism. But, contrary to Lysenko's view, the environment is held not to induce direct adaptation and sudden development of new improved forms of plants.

The following breeding methods are recommended for improving cultivated plants; mass and single-plant selection, hybridization, utilization of heterosis, application of ionizing radiation and the induction of polyploidy.

1101 Stănescu, Z.
Cercetări sovietice in legătură cu unele aspecte ale procesului fecundării la plantele agricole. (**Soviet investigations concerning some aspects of the process of fertilization in agricultural plants**).
An. Romîno-Soviet.: Ser. Agric.-Zooteh. 1958 : **12** : No. 1 : 61–73.

Recent Soviet work on fertilization is reviewed, principal attention being paid to the views of Lysenko's school on this topic. Among the aspects considered are selective fertilization, multiple fertilization and supplementary pollination.

1102 Haimovici, B.
Cercetări asupra electivității în procesul fecundării la plante. (**Investigations on selectivity in the process of fertilization in plants**).
An. Romîno-Soviet. : Ser. Agric.-Zooteh. 1958 : **12** : No. 3 : 47–58.

Recent work by Lysenko's school on the above topic is reviewed.

1103 Jain, S. K.
Male sterility in flowering plants.
Bibliogr. genet. 1959 : **18** : 101–66.

In this review the following topics are considered: the definition of male sterility; modes of origin; types of male sterility; inheritance—it is noted that in the great majority of cases of genically controlled male sterility a single recessive gene is involved; mode of expression; induction experiments; utilization in plant breeding; and evolutionary significance.

1104 Silk, M. H. & Hawtrey, A. O.
Possible simplified structure of deoxyribonucleic acid.
Nature, Lond. 1959 : **184** : No. 4697 : Supp. No. 19 : 1484–85.

As an alternative to the Watson-Crick model of DNA, the authors propose a model in which the two polynucleotide chains of the double helix are identical. It is supposed that each chain consists of an even number of bases such that, if bent back on itself, the juxtaposed bases would be complementary. The base sequences of the two chains are taken as identical though reversed relative to each other; base complementarity between the two chains is therefore maintained. Such a model would permit the existence of single polynucleotide chains during resting periods.

1105 Horowitz, J. & Chargaff, E.
Massive incorporation of 5-fluorouracil into a bacterial ribonucleic acid.
Nature, Lond. 1959 : **184** : 1213–15.

It has been shown that nearly half of the RNA uracil of *Escherichia coli* 'B' can be replaced by 5-fluorouricil when the latter is present in the culture medium. However, this substance appears not to enter the DNA.

1106 Hoagland, M. B.
Nucleic acids and proteins.
Sci. Amer. 1959 : **201** : No. 6 : 55–61.

The following hypothesis of protein synthesis is outlined. Individual aminoacids are attached to specific transfer RNA molecules by means of appropriate enzymes, energy being supplied by adenosine triphosphate. The transfer RNA-aminoacid complexes then become attached to template RNA by means of identifying nucleotide triplets so that the aminoacids become juxtaposed. The aminoacids then combine to form a specific protein, leaving the template and transfer RNAs available for a fresh cycle.

TAXONOMY

1107 Lamprecht, H.
Der Artbegriff. Seine Entwicklung und experimentelle Klarlegung. (**The species concept. Its development and experimental elucidation**).
Agri. hort. genet., Landskrona 1959 : **17** : 103–264.

After a short historical survey of the subject, the author considers in detail the bearing of his own work upon the species concept. In crossing *Phaseolus vulgaris* with *Ph. coccineus*, the hybrids were normal and fertile and recombinations of all the characters except two were obtained in the F_2. These two, cotyledon position and stigma form, each segregated in the F_2 into 1 normal maternal: 2 partially sterile intermediate: 0 or very few highly sterile paternal types [cf. XXVIII, 3507]. Among 21 genes studied in crosses of *Chrysanthemum carinatum* with *Ch. coronarium*, that governing degree of leaf dissection behaved in a similar way to the two above *Phaseolus* genes. Genes of this type, which cannot be expressed in the homozygous condition in foreign cytoplasm, or only with a high degree of sterility, are termed interspecific; other genes are described as intraspecific. The possession of different alleles of an interspecific gene forms an unbreakable barrier between species. Mutations in interspecific genes to alleles characteristic of other species have been studied in *Pisum* and *Phaseolus* [cf. XXIX, 3272] and have been found to be always recessive and to result in vegetative changes accompanied by floral abnormalities and sterility or in floral changes and sterility alone.

On the basis of these observations, it is suggested that a species may be defined as the sum of all individuals carrying the same alleles of interspecific genes. According to this definition, many forms previously regarded as specifically distinct can no longer be termed species, examples being cited from *Lactuca*, *Geum*, *Cucurbita*, *Nemesia*, *Petunia*, *Lolium*, *Avena* and *Pisum*. Thus *Pisum sativum*, *P. elatius*, *P. fulvum*, *P. humile*, *P. jomardi* and *P. abyssinicum* are all considered to be ecotypes of *P. arvense*. An interspecific allopolyploid, combining different alleles of the interspecific genes, forms a distinct species; an autopolyploid does not.

It is suggested that genes are formed by progenes which are reproduced only during reduction division and which consequently may be gradually depleted, leading to senescence unless sexual reproduction is effected.

Systematic categories based on the above considerations are described. Allopolyploid species are termed addospecies, and these and the primary species defined above contain the following subdivisions: (1) superspecies, with an alteration in chromosome number; (2) mixtospecies, with changes in chromosome structure; (3) apomicts; (4) ecotypes, which are genically and physiologically distinct; and (5) varieties, which are genically distinct but do not differ appreciably in ecological requirements. The nomenclature of forms falling into any of these categories is discussed.

1108 **Breeding better yeasts.**
Agric. Res., Wash. 1959 : **8** : No. 5 : p. 7.

Studies made on *Hansenula wingei* by L. J. Wickerham at the Agricultural Research Service, Northern Division, Peoria, Illinois, are mentioned in connexion with the discovery of sexual agglutination in three more genera of yeast. No details are given.

CROP PLANTS

World Congress of Agricultural Research.
FAO, Rome 1959 : Pp. 1458.

1109 *de Cillis, U. Sviluppo e fattori di progresso della cerealicoltura.* (*Development and factors of progress in grain culture*). (*pp. 165–77*).

Figures presented show that the mean wheat yield for the world as a whole has risen from 9·4 c. per ha. before the second world war to 11·7 c. per ha. in recent years; for maize the yield has risen from 13·2 c. to 14·9 c. Increases are recorded also for barley and rye, though not for rice or oats. Part of the rise in yield is ascribed to improvements in agricultural techniques, a number of which are examined; the other part is ascribed to genetic improvements that enable the varieties grown to benefit from the improved cultural conditions; the introduction of hybrid seed has effected a 30% increase in maize yield. Some of the other methods that have been employed by cereal breeders are mentioned, special importance being attached to breeding for resistance to cold, lodging and rust.

1110 *Bonvicini, M. La canapa nella sperimentazione agraria.* (*Hemp in agricultural experimentation*). (*pp. 217–38*).

In a review of the research that has been carried out on the hemp crop, special reference is made to the genetic improvement effected in Germany by Bredemann, Sengbusch and others and to studies on monecious hemp made by workers in various countries. Varieties with greatly improved fibre yields selected in Italy from the German material are still inferior in fibre quality. They have been crossed with the local Carmagnola in the hope of improving quality and utilizing the effect of heterosis.

1111 *Koblet, R. Die Forschung auf dem Gebiete des Futterbaues.* (*Research in the field of fodder cultivation*). (*pp. 299–322*).

Some general remarks are made on breeding fodder crops and a table shows the organization of grass and clover breeding in the USA.

1112 *El-Helaly, A. F. The role of research in the improvements of agriculture in Egypt.* (*pp. 543–48*).

Physiological races of stem rust found in Egypt are listed; the wheat variety Mochtar has proved to be very resistant. Lubia Fitriat, a selection from *Vigna sinensis*, is immune to rust and resistant to nematodes. Tomato Fitriat and Tomato Fitriat 5 are immune to wilt and *Prunus davidiana* has proved to be resistant to nematodes and also withstands the effects of a high water table.

1113 *Dumon, A. G. L'effet de l'hétérosis et de la combinaison de facteurs dans l'amélioration du seigle. (The effect of heterosis and the recombination of factors in breeding rye). (pp. 567–69).*

Genetical studies and the breeding work leading to the production of the variety Seigle des Célestins [Célestins rye] are described [cf. XXIX, 3540].

1114 *Larose, E. La mutagénèse dans l'amélioration des plantes. (Mutagenesis in the improvement of plants). (pp. 571–79).*

An account is provided of work carried out at Gembloux on the induction of mutation in barley and *Triticum aestivum* by X irradiation [cf. XXIX, 2654].

1115 *Larose, E., Legros, R. & Bienfet, R. Étude critique de certaines méthodes d'appréciation de la valeur technologique des froments. (A critical study of certain methods of estimating the technological value of wheats). (pp. 581–89).*

Indirect methods used in Belgium for determining the technological quality of grain and flour were not found to be satisfactory. A bread-making test using the bakery techniques of the country concerned is thought to be the best method.

1116 *Sánchez Monge, E. Realizaciones actuales y futuras del Centro de Mejora del Maíz del Instituto Nacional de Investigaciones Agronómicas. (Present and future work of the Maize Breeding Centre of the National Institute of Agronomic Investigations). (pp. 591–92).*

The collection of germ plasm, the development of pure lines, tests of combining ability and the production of double hybrids are among the activities of the above centre in Madrid. Four double hybrids are described: Alcalá 815, from (1·259 x 1·056) x (1·125 x 1·207), a white semident forage type for the Levante zone; Alcalá 427, from (Hy x M14) x (W23 x W26), and Alcalá 428, from (Os. 420 x M14) x (W23 x W26), both yellow dents and recommended for several districts; and Alcalá 724 (K148 x K150) x (1·131 x 38–11), a yellow dent particularly suited to the maize zone of southern Spain.

1117 *Garaudeaux, J. Étude de la composition minérale de quelques souches de Graminées. (A study of the mineral composition of some strains of Gramineae). (pp. 593–99).*

The sodium and potassium contents of six strains of cocksfoot and four strains of meadow fescue after treatment with various doses of potassium fertilizer were determined. Differences in mineral content were found between species and between strains within species.

1118 *Lelley, J. Die Lage der Getreidezüchtung in der Ungarischen Volksrepublik. (The state of cereal breeding in the Hungarian People's Republic). (pp. 601–07).*

The breeding of wheat, rye and barley is briefly discussed. In all cases attention is being given to improving yield, quality and resistance to disease and extreme climatic conditions. Also attempts are being made to adapt the cereals to mechanical harvesting.

1119 *Csitkovics, A., Kovács, I. & I'so [I'só], I. Ungarische Volksrepublik. Hackfrüchte. (The Hungarian People's Republic. Root crops). (pp. 635–40).*

A brief review of the beet breeding carried out in Hungary during this century is provided. Breeding for resistance to virus yellows, *Cercospora* and bolting in sugar beet is under way. Brief notes are given on the three mangel varieties cultivated at present and on current aims in mangel breeding; reliable yielders which can withstand the severe climate are needed. Maize breeding in Hungary is also briefly discussed; the primary aims are to improve standing capacity and resistance to disease and drought.

1120 *Donà dalle Rose, A. La sperimentazione nel settore della barbabietola da zucchero in Italia. (Research in the sugar-beet section in Italy). (pp. 645–58).*

The organization of research on sugar beet in Italy is explained. In the section on plant breeding mention is made of the merits of tetraploid beets such as Cesena poliploide [Polyploid Cesena] produced in Italy, of Cesena NSA which is so resistant to bolting as to be considered a triennial, of cultivars suitable for autumn sowing in southern Italy and of hybrids with wild beets.

1121 *Alcaraz Mira, E. Tabaco. (Tobacco). (pp. 661–67).*

Work on tobacco in Spain has resulted in the replacement of older dark tobacco varieties by Santafé (Valencia x Round Tip) and of light varieties by White Burley Resistant. More recently, Santafé has begun to be replaced by the productive hybrid Híbrido 251 (Maryland x Mammoth Gold) and by other new dark Burley types.

1122 *Oyanguren, J. de. Cultivo del arroz: la Estación Arrocera de Sueca. (Rice cultivation: the Sueca Rice Station). (pp. 669–75).*

This short survey of the breeding work of the above station in Spain [cf. XXVIII, 2994] includes a list of crosses carried out since 1951 and a further list of hybrids which have been released.

1123 *Kurnik, E. Ölpflanzenforschungen in der Ungarischen Volksrepublik. (Oil-plant research in the Hungarian People's Republic). (pp. 677–84).*

Sunflower is now the most important oil-seed crop in Hungary, although it has only been cultivated on a large scale during the past 20 years. Breeders have attempted to produce productive early varieties with a short stem and a single flower; such types are suitable for mechanized farming. These aims were realized in the varieties Iregszemcse, Lovászpatona and Mezőhegyes. The improved varieties give yields of 20–25 dz. per ha. At present the primary aim of the breeders is to improve the oil content and it seems that it will be possible to raise this to 40%. Some progress has also been made in breeding for resistance to pests and diseases. Iregszemcse and Lovászpatona are almost completely resistant to *Homeosoma nebulella* and Mezőhegyes and Kisvárdai are partially resistant. Selections from hybrid populations show some resistance to *Orobanche*. Heterosis experiments have not been successful. At the Iregszemce station, a new breeding procedure was developed. This method involves treating selected haploid individuals with colchicine; selections are made from the resulting homozygous lines and these may be used in heterosis experiments. Plants obtained in this way appear promising for the breeding of more productive varieties.

Mention is also made of research on soya bean. Some progress has been made in developing improved fodder types with abundant foliage. Some useful mutants were obtained by treatment with colchicine and X-rays.

1124 *Barbieri, R. Sperimentazione su colture industriali in Italia (cotone, pomodoro, tabacco). [Research on industrial crops in Italy (cotton, tomato and tobacco)]. (pp. 685–89).*

Cotton. In addition to Stoneville 2B, Coker 100 W and Deltapine, two newer cultivars, Kanno 41/1 and MO/PA, are proving promising in Sicily on account of their earliness and yield.

Tobacco. Studies of mutations induced by thermal neutrons and γ rays have been made in the varieties Virginia Bright, Maryland, Burley and Xanthe Yaka [Xanthe Foot-hills]. Other studies concern the production of hybrids free from nicotine and the use of interspecific crosses.

Tomato. Yields of up to 1300 c. per ha. have been obtained from new cultivars suitable for juice production such as Prospero 39 from Bologna. Hybrids and selections of the S. Marzano type, suitable for peeling, have been produced at various stations.

1125 *Brookson, C. W. Seedlings and clones of* Hevea brasiliensis. *(pp. 699–703).*

At the Rubber Research Institute of Malaya, the breeding procedure involves making clones from all the seedlings of experimental crosses and the clones are then tested and evaluated on their own merits. In an alternative method, clones are only produced from selected high-yielding seedlings. The second method has certain practical disadvantages. Also it is not yet known whether the correlation between the yield of the seedling mother tree and of the clone is sufficiently good to justify this method. This question has to be decided by a long-term experiment. Meanwhile attempts will be made to discover a family in which the correlation is high; for such a family the second breeding method would be used. Taking buds from the stem of a young seedling produces trees of the juvenile type which have a conical shape; the mature types are cylindrical. Juvenile buddings are selected from the first mentioned breeding procedure. A good correlation was found between the yield of juvenile buddings and that of mature buddings obtained from older seedlings.

1126 *Spaldon, E. Einige Forschungsergebnisse ueber den Anbau von Spezialkulturen in der Tschechoslowakischen Republik. (Some results of research on the cultivation of special crops in the Czechoslovakian Republic). (pp. 705–09).*

The development and growth habit of tobacco varieties has been studied in detail; varieties are classified into three groups according to the length of time they remain in the rosette stage. The new variety of sweet pepper Agronomka is much superior to the varieties hitherto cultivated in Czechoslovakia.

1127 *Herrero Catalina, J. Trabajos sobre fruticultura en la Estación Experimental de Aula Dei de Zaragoza. (Work on fruit culture at the Aula Dei Experimental Station, Saragossa). (pp. 727–34).*

The work includes the collection and identification of varieties of plum, peach, apricot, cherry, apple and pear, tests of lime-induced chlorosis in different varieties and studies of graft compatibility.

1128 *Mihaly, L. Übersicht der Forschungsarbeit für Garten- und Obstbau in Ungarn. (A survey of the research work for horticulture in Hungary). (pp. 745–53).*

A brief mention is made of some valuable new varieties of sweet pepper and tomato bred in Hungary. Some progress has also been made in producing improved fruits and nuts.

1129 *Breviglieri, N. La sperimentazione nella fruitticoltura. (Research in fruit growing). (pp. 755–61).*

The main stations dealing with the subject in Italy are named, with indications of their activities, particular reference being made to improved cultivars of grape, peach and other fruits produced by Pirovano, peach, pear, cherry, kaki, chestnut and other species by Morettini, apples, pears and peaches by Breviglieri and peaches by Casella, and to studies of pollination in a wide range of fruits.

1130 *Misic [Mišić], P. D. Investigation of the incompatibility of autochthonic pear varieties. (pp. 763–65).*

Among 60 cross combinations involving 24 local Yugoslavian varieties, 49 were compatible or partly compatible and 11 were incompatible. Six of the latter were between diploids only and five involved the triploid Dimničarka.

1131 *Carrion, P. Portainjertos americanos y variedades europeas. Experiencias de la Estación de Viticultura y Enología de de Requena (Valencia) España. (American rootstocks and European varieties. Experiments at the Requena Enological and Viticultural Station, Valencia, Spain). (pp. 769–79).*

On the basis of trial results, rootstocks for different regions in Spain and grape varieties for the production of wines of different qualities are recommended.

1132 *Martínez Zaporta, M. Mejora de portainjertos. (Rootstock breeding). (pp. 801–04).*

Selections from F_1 hybrids of *Vitis vinifera* with the *Phylloxera*-resistant American species *V. riparia* and *V. rupestris* proved unsatisfactory in badly infested areas in Spain. The hybrid Millardet 41B, however, although its American parent, *V. berlandieri*, is less resistant than *V. rupestris* or *V. riparia*, has done well and has yielded selections of which one at least appears to be superior to Millardet 41B in vigour, rooting ability and drought resistance. So far this selection has done well in grafting trials.

1133 *Dalmasso, G. La sperimentazione nella viticoltura. (Research in viticulture). (pp. 821–31).*

The centres at which research on vines is carried out in Italy are enumerated and an outline is given of the work carried out in the last ten years. This includes the identification of a certain number of direct-producer hybrids found suitable for growing in Italy and the description of the cultivars most suitable for different regions of Italy and of the best rootstocks [cf. XXVIII, 3407]. New cultivars produced by Pirovano, Prosperi, Bruni and Ceccarelli are also mentioned.

1134 *Jacoboni, N. Sperimentazione agraria nella' olivicoltura. (Agronomic research in olive growing). (pp. 841–49).*

The studies outlined include observations on the floral biology of a large number of olive cultivars, the confirmation of the chromosome number $2n = 46$ in the olive, the description of both irregular and regular microsporogenesis, description of the main cultivars of a number of localities, the discovery of a wide range of bud mutations and a series of hybridizations made with the object of combining yield, quality and other desirable features. The cultivars have also been classified according to their cold resistance.

1135 *Coutinho, L. de A. Elementos citogenéticos que han de reunirse para el "mejoramiento" de la* Olea europaea, *L. (Cytogenetic elements which must be combined in breeding* O. europaea *L.). (pp. 851–55).*

The marked variations in fertility have been found to be related to the occurrence of physiologically and morphologically male flowers in addition to the normal hermophrodite flowers. Meiotic irregularities have also been detected. Some varieties have $2n = 46$, while others have an extra chromosome, giving $2n = 48$. It is thought that the species has originated through hybridization between two unidentified forms with $n = 11$ and $n = 12$ respectively, followed by chromosome doubling. This hybridity results in instability of many characters under sexual propagation. The possibility of breeding by interspecific hybridization with *O. laperrini* and *O. chrysophylla* is mentioned.

1136 *van Bogaert, G. La présence de gousses à plusieurs graines dans le trèfle violet.* (*The presence of pods with several seeds in red clover*). (*pp. 859–63*).

The occurrence of two seeds in the pod of red clover instead of the usual one appears to be under genetical control; the mode of inheritance is not known but it is thought to be complex. A few pods with three seeds have also been found.

1137 *Mayer, R. La sélection des plantes fourragères en France.* (*The breeding of forage plants in France*). (*pp. 875–83*).

The breeding of fodder plants was started in France about 10 years ago and the breeding aims are here discussed in general terms. In all cases it is important to produce types which are homogeneous in their cycle of development and growth habit; in order to attain homogeneity, inbreeding is carried out, mass selection having been proved to be rather inefficient. The best inbreds are tested for combining ability and used to produce hybrid or synthetic varieties. Many valuable varieties of grasses and legumes have been produced using this method of breeding.

1138 *Kurnik, E. Die Lage der Futtergewinnungsforschungen in der Ungarischen Volksrepublik.* (*The state of research on producing fodder in the Hungarian People's Republic*). (*pp. 885–90*).

Special attention is being given to the breeding of forage legumes rich in digestible protein. Hybridization and in particular a breeding procedure based on the polycross test are used more than individual selection. A synthetic lucerne now undergoing preliminary trials has surpassed the best Hungarian land varieties in yield of green fodder, dry matter and protein; it is also more resistant to *Pseudopeziza medicaginis*.

1139 *Haussmann, G. Sperimentazione agraria italiana sulle colture foraggere.* (*Agricultural research on forage crops in Italy*). (*pp. 891–900*).

The centres of research are listed and recent results enumerated. These include breeding work with the main species of forage legumes and grasses and the study of a number of cultivars introduced from elsewhere, the most promising of which are enumerated; they include hybrid sorghums from the USA. Local species showing promise as forage plants include *Helminthia echioides* and *Scorpiurus muricata*.

1140 LANDI, R.
Uomini ed argomenti della genetica agraria: gli incontri internazionali di Colonia e di Castrocaro. (**Men and subjects of agricultural genetics: the international meetings at Cologne and Castrocaro**).
Ital. agric. 1959 : **96** : 1095–100.

Reference is made to Eucarpia and its meeting at Cologne in July, 1959, and to the sixth meeting of the Società italiana di Genetica agraria [Italian Society of Agricultural Genetics] at Castrocaro in October of the same year, the latter meeting being devoted particularly to the induction of useful mutants by irradiation.

1141 SCHICK, R.
Zehn Jahre Pflanzenzüchtung in Gross-Lüsewitz. (**Ten years' plant breeding in Gross-Lüsewitz**).
Dtsch. Landw., Berl. 1959 : **10** : 479–85.

The development of the breeding institute at Gross-Lüsewitz from small beginnings in 1949 is described and an account is presented of the work done with potato and forage and oil crops.

Proceedings of the Third Meeting of the Hungarian Biological Society, Budapest, May 5–7, 1959.
Acta. biol., Budapest 1959 : Suppl. **3** : Pp. 52. (Absts.).

1142 *Fábián, G. Methodological problems in genetical research.* (*pp.* 9–11).

The following phases of genetical investigation are briefly considered: observation; biometry; Mendelian analysis; cytogenetics; cytomorphosis, in which the normal course of development is compared with that showing hereditary deviation; physiological genetics; methods resulting in genetical change, such as mutation and bacterial transformation; and finally the use of a combination of methods in breeding. It is considered that while the inheritance of simple qualitative characters is readily explained on a Mendelian basis, theories regarding the inheritance of complex quantitative characters are less satisfactory and improvements in the techniques of investigation are necessary.

1143 *Farkas, G., Solymosy, F. & Király, Z. On the mechanism of the hypersensitive reaction of infected plants.* (*p.* 29).

In studies of various wheat/rust and tobacco/virus combinations, the hypersensitive reaction of resistant plants was always accompanied by an immediate and marked stimulation of polyphenolase activity in the host tissues around the lesions together with an accumulation of quinones. In systemic infections in susceptible plants, an increase in polyphenolase activity occurred throughout the infected leaf, but only during the later stages of disease development; no accumulation of quinones was observed. The suggestion that in resistant tissues the oxidation/reduction system is upset, so that quinones accumulate as a result of an increased polyphenolase activity which cannot be counteracted by the reduction system, is supported by the observation that the infiltration of reducing substances such as ascorbic acid, glutathione and cysteine into tobacco leaves inhibits lesion formation. Further, in infected resistant tissues, the quantity of reducing substances decreases as the quinones, which react with ascorbic acid and other reducing substances, accumulate. No change in ascorbic acid content was found in infected susceptible tissues.

1144 *Kovács-Schneider, M. Comparative studies on vegetative development of di- and tetraploid tomatoes.* (*p.* 30).

The effects of polyploidy in (*a*) wild species, (*b*) cultivated tomatoes and (*c*) intermediate types were studied. The polyploids had larger seeds in all (*a*) plants, in 50% (*b*) plants and in 75% (*c*) plants. About 50% of the (*b*) and (*c*) polyploids showed an increase in dry weight. A higher phosphorus content was found in 66% (*b*) and 75% (*c*) types and an increased rate of development in 30–50% (*b*) types and 70–80% (*c*) types. In all three groups, 50% of the polyploids had longer and wider leaves. Two (*b*) and two (*c*) polyploids showed early development of new leaves and flowered and set fruit at the same time as diploids. Tetraploid fruits were generally smaller with fewer seeds.

1145 *Hegedűs, A. Studies on the possibility of distinguishing vine stock varieties by histological investigation of canes.* (*p. 31*).

Measurements of pith diameter, xylem thickness, xylem : pith ratio, phloem thickness, average number of bands of phloem fibres and vessel diameters in canes of 12 varieties showed significant differences between some of the varieties in some of the characters.

1146 *Barabás, Z. Parallel mutations in polyploid series of wheat.* (*p. 33*).

Radiation-induced mutation in yield characters was investigated at three levels of ploidy in *Triticum aestivum, T. carthlicum, T. timopheevi* and *T. monococcum.* The irradiated material differed little from the controls in the mean values for the characters studied but showed greater dispersion values, these being greater at the lower ploidy levels. With regard to the qualitative effects of irradiation, the greatest number of different types of mutant occurred at the hexaploid level, with appreciably fewer at the diploid and tetraploid levels. A vavilovoid mutant resembling the hexaploid *T. vavilovii* occurred in the X_3 of the tetraploid *T. carthlicum.*

1147 *Győrffy, B.* et al. *Genetic studies of a phytopathogenic* Xanthomonas. (*p. 34*).

Mutants of *X. phaseoli* var. *fuscans* which require asparagine or asparagine + proline have been isolated, as have also forms resistant to streptomycin, chloramphenicol, penicillin and phage. Streptomycin resistance has been used successfully as a marker in transformation experiments.

1148 *Daniel, L. & Váróczy, E. On the inheritance of fasciation of ears of maize.* (*p. 35*).

In diallel crosses involving selfed lines of four-rowed (P4) and eight-rowed (P8) flint maize, 12-rowed (P12) and 18-rowed (P18) dent maize and an approximately 40-rowed pop corn (P40) with fasciated spherical ears, the occurrence of branched ears, which was most frequent in P40, showed no correlation with row number and was inherited independently of fasciation. The frequency of fasciation increased with increasing row number and appeared to be inherited quantitatively except in the cross P18 x P40, which gave an F_1 with 93–100% fasciated ears, back crosses to the first and second parents with 51% and 65% respectively, and an F_2 with 62%. Since in other combinations P18 gives no more than 2·78% fasciated ears, it is suggested that P40 carries a monogenic recessive factor *fs* while P18 bears the dominant *Fs* and a suppressor factor or factors *Su.*

1149 *Kovács, A. New forms in* Zea x Euchlaena *hybrids.* (*p. 35*).

Crosses of *E. mexicana* with dent and sweet corn could be effected only under short-day conditions in the greenhouse. The hybrids showed an increase in dry weight and improvements in carbohydrate, protein and aminoacid content compared with maize. Further crosses were readily effected. The level of improvement fell off in back crosses to maize but remained higher than in the parents [cf. XXIX, 3810]. On the basis of the morphological changes observed in the hybrids, the author agrees with Mangelsdorf that maize may have hybridized with teosinte at some stage of its history [cf. XXIX, 3370].

1150 *Pásztor, G. Studies on heterosis phenomena induced by transplantation in later generations of tomato. (p. 36).*

In vegetative hybrids produced in 1953 by grafting Mikado on Sárga körtealakú [Yellow Pear-shaped], the first generation showed a heterotic effect in yield which became progressively more in the second and third generations and was maintained in the fourth and fifth generations. In this respect the vegetative hybrids were superior to the sexual hybrids with which they were compared. The vegetative hybrids were unlike the sexual hybrids in that heterosis in morphological characters did not extend to the whole plant.

1151 **Agricultural institutes of research and experimental services governed by the Ministry of Agriculture.**
Hungar. agric. Rev. 1959 : **8** : No. 3 : 1–3.

A list of the addresses and principal activities of 24 agricultural research organizations in Hungary is presented; about a dozen of these are concerned with the breeding, production and testing of crops.

1152 Årsberättelse över Sveriges Utsädesförenings verksamhet år 1958. (**Annual report of the work of the Swedish Seed Association, 1958**).
Sverig. Utsädesfören. Tidskr. 1959 : **69** : 127–225.

Mutagens. Studies of the effects of 8-ethoxycaffeine, myleran and ethyleneimine are in progress [cf. XXIX, 165, and 1539 and XXX, 95].

Allopolyploids. In breeding artificial rape and swede, chromosome doubling has been effected in numerous *Brassica* species, including various forms of broccoli, wild cabbage, turnip rape and turnip. Embryo culture is being used in the development of amphidiploids of *Hordeum* x *Secale*, *Brassica*, *Trifolium* and *Festuca* and *Lolium*. Differences in protein between wheat, rye and their hybrid are being studied by serological and electrophoretic methods.

Wheat. Among winter wheats at Svalöf, the best yields were given by the stiff-strawed variety K01607, a new Hansa-type from Eroica I x Hansa and some lines from Svale. Material showing promise with respect to yield has been obtained by convergent breeding. Among spring wheats, sown very late because of the later winter, Sv01311 [(Sv01180 x Kärn II [Kernel II]) x Pondus] was best, followed by Sv01320b (Sv0971b$_2$ x Kärn II) and Sv01290 (Diamant II [Diamond II] x Kärn II^2). Durum wheats have proved unsatisfactory in Sweden, being low in yield and straw strength.

At the Kalmar branch station the new winter wheats K01607, Sv53/412, K56/86 and K56/89, all from Eroica I x K01281, combined high yields with good straw strength. Sv01270 and Sv01311 gave 30% higher yields than Kärn II [Kernel II].

At the Värmland station, the very hardy, stiff-strawed winter wheat Vrm 01134C$_9$, derived from Pärlvete II [Pearl II wheat], yielded most and matured one day later than Odin.

Lines from Odin x Eroica, particularly U52/538, which is now being tested more extensively, have done well at Ultuna.

Oats. The new line Å01680 (Å33/79 x Sol II [Sun II]) and material from Dippes früh [Dippe's Early] x Örn [Eagle] have yielded well. Known genes for resistance to black rust have been shown to be inadequate for the control of this pathogen in Sweden.

At the Kalmar station, lines from Sisu [Courage] x Blenda, K01509 x Sisu and K01509 x Sol II [Sun II] showed promise and at the Västernorrland station Å01681 and Å01651 combined earliness with very stiff straw and high yielding capacity. Å49/355 also yielded well and appears to be suited to poor growing conditions.

Rye. Sv0201 (Petkus x Od), two lines from a cross of spring and winter rye and some tetraploid spring ryes are being studied. Chromosome doubling has been effected in several primitive forms of rye for use in breeding. The occurrence and effects of supernumerary chromosomes in different varieties are under investigation. At Kalmar, K44/12 (Kungs [King's] x Gotland local race) was the most productive.

Barley. The new two-rowed lines Sv02148 (Sv30/19 x Balder) and Sv02127 (Balder x Heimdal) were productive and stiff strawed. The very stiff-strawed early mutant Sv04080 is mentioned as an outstanding barley at most of the stations. The six-rowed mutant Tidig 7 [Early 7] yielded 19% and the strong-strawed two-rowed barley Sv15/141 (Sv30/19 x Freja) 17% more than Presto, both maturing four days later. Among winter barleys, the highest yield and stiffest straw were found in Sv56/33 (Kenia x Mansholts).

At the Västernorrland station Å54/338 (Å38/230 x Maja) and Å54/260 were at least equal to the mutant Sv04080 in suitability for combine harvesting. At the Västgöta station, Sv02102 and Sv02148 were particularly promising and at the Övre-Norrland station a line from Norrbotten x Edda I outyielded Edda I by 14% and was two days earlier.

Grasses. At the Östgöta branch, *Poa pratensis* 'Sv01627', from X-irradiated material, gave the highest yields in the second, third and fourth cuts.

Clover. The tetraploid red clover Sv035 has given high yields. Tetraploids have generally proved superior to diploids in *Sclerotinia* resistance, but marked variations in nematode resistance are found among both diploids and tetraploids.

Good yields have been given by white clovers of New Zealand origin, including Kivi [Kiwi] [cf. XXIX, 3530].

Tetraploid Alsike clovers were appreciably more productive than diploids in both first and second-year leys, the Weibull variety Tetra being particularly good.

Work on chromosome doubling in clovers continued and several interspecific crosses have been effected.

Lupin. Crosses between various early mutants and Weiko III have been effected.

Beet. Attempts to develop male-sterile lines for the production of triploids in mangels and sugar beet are in progress.

Potato. Two populations of *Heterodera rostochiensis* from Skåne have broken down the resistance found hitherto in *Solanum andigenum* material. Resistance to Swedish races is now being studied in *S. vernei* and *S. gourlayi*. Blight resistance and good yields have been observed in five clones at the Kalmar station. At the Värmland station, lines from Magnum Bonum x Elsa, Sv46049 x Majestic and Sv47068 x Majestic have yielded about 18% more than Up to Date.

Flax. Incidence of *Polyspora lini* was particularly high in populations with the rust-resistant North American variety Cascade as one parent. In the Netherlands, Svalöf varieties have proved highly resistant to *Botrytis cinerea* and *Ascochyta linicola*.

Tobacco. Promising results in cigarette-making tests have been obtained with two new lines.

Rape. The swede rapes Sv56/1238, from Artificiell [Artificial], and Sv55/1069 have yielded well.

Broad bean. The new field bean U54/208 (39/11 x Pirrhonen) has proved very early.

Pea. The cooking peas Concordia, U03301, U03521 (Ambrosia II x 03101) and Strål [Ray] and the fodder pea U05804 (Hero x Artturi) all outyielded the standard Torsdags III [Thursday III]. U03521, which is also good in quality, and another productive new pea are now being multiplied at the Ultuna branch. At the Östgöta station, Ög55/141 was more productive and earlier than Concordia, and at the Jämtland station, L06341 was promising in yield and early growth.

Annual Report of the National Institute of Genetics, Japan 1957 (1958) : No. 8 : Pp. 115.

1153 *Sakamoto, S. Ecogenetical studies in* Agropyron. (*pp. 34–36*).

An ecotype of *A. tsukushiense* var. *transiens* and natural and artificial hybrids between this variety and *A. mayebaranum* are described. The hybrids usually formed 21_{II}. Their complete sterility may be due to cryptic structural differences between the chromosomes of the two species.

1154 *Kihara, H. Morphological and physiological variation among* Aegilops squarrosa *strains collected in Pakistan, Afghanistan and Iran.* (*pp. 36–37*).

[Cf. XXIX, 3743].

1155 *Tateoka, T. Karyotaxonomic studies in Poaceae, V.* (*pp. 37–38*).

Work on *Brachyelytrum* [cf. XXVIII, 1753] and *Astrebla* is reported. *A. lappacea* and *A. A. pectinacea* have $2n = 40$. On the basis of caryotype and leaf anatomy, *Astrebla* should be placed in the Chlorideae. The author lists the subfamilies and tribes into which he suggests the Poaceae should be classified [cf. XXIX, 3930].

1156 *Oka, H.-I. Fertility variation due to "gametic-development genes" in hybrid populations of rice.* (*pp. 39–40*).

On the basis of the hypothesis suggested to explain the sterility of hybrids between distantly related rice varieties [cf. XXVIII, 4257], the author interprets data on segregation of the gene pair for the glutinous *vs.* nonglutinous condition and on fertility in the F_2 and back crosses of 414 (*indica*) x 563 (*japonica*).

1157 *Oka, H.-I. Back-cross experiment between distantly related varieties of rice—an interaction between maternal and gametic genotypes.* (*pp. 40–42*).

Back crosses of 414 (*indica*) x 504 (*japonica*) were repeatedly made, using the latter as recurrent parent. The F_1 had 20–24% seed fertility, no reciprocal differences being detected. In the early BCs, fertility ranged from 10 to 80%, plants with 30–50% being relatively frequent. In later generations (BC_5 and BC_6), most plants were 30–50% fertile. Further back crossing did not lead to improved fertility. In about 67% and 83·5% of BC_5 and BC_6 plants respectively, all the chromosomes should have been derived from the recurrent parent. The sterility persisting in these plants therefore suggested a cytoplasmic effect. With the recurrent parent as ♀ in the back crosses, the progenies were however semisterile, although having the same cytoplasm as the recurrent parent. In contrast, plants produced by selfing the semisterile progeny were almost completely fertile, without any marked segregation in fertility. These results may be explained as follows. A pair of genes, AA_1, is involved, gametes with A_1 deteriorating if A is present in the mother tissue. Assuming parents 414 and 504 to have the genotypes AA and A_1A_1 respectively, the F_1 may be expected to be 50% sterile and to produce only A gametes. In addition, it is suggested that AA_1 could represent a group of linked genes. This hypothesis provides an alternative to that of the gametic-development genes [cf. XXVIII, 4257]. The only phenomenon which the new hypothesis fails to explain is the restriction on recombination of independent genes in partially sterile hybrids, but the earlier hypothesis cannot account for the results of the present experiment. The author has also suggested that duplicate fertility genes may occur [cf. XXVIII, 3872]. It therefore appears that sterility in hybrids between distantly related varieties may be due to several types of genetic control.

1158 *Takenaka, Y. Cytogenetic studies on the genus* Nicotiana *X. (pp. 43–44).*

Information is given on meiosis in PMCs of the F_1 of (1) *N. tabacum* ($n = 24$) x *N. otophora* ($n = 12$), (2) *N. tabacum* x *N. longiflora* ($n = 10$), (3) *N. gossei* ($n = 18$) x *N. tabacum* and (4) *N. gossei* x *N. alata* ($n = 9$). Since the number of bivalents and trivalents per cell at metaphase I in (1) totalled 12, it apeared that the genome of *N. otophora* was the same as one of the genomes of *N. tabacum*. In (2), only $0–4_{II}$ were formed, with the mode at 0–1. It was thus difficult to decide whether affinities were allosyndetic or autosyndetic. In (3), the number of bivalents ranged from 0 to 5, with the mode at 1. This pairing was probably due to autosyndetic affinities between the two genomes of amphidiploid *N. tabacum*. Meiosis in (4) was highly irregular, only a few pollen grains being produced per anther. The parent species are therefore not related.

1159 *Furusato, K. & Ohta [Ota], Y. Notes on seedless citrus species. (p. 44).*

Parthenocarpic fruits were obtained from *Citrus leiocarpa*, Hassaku [First Day of the Eighth Month], *C. madurensis*, *C. aurea*, *C. grandis* x *Poncirus trifoliata*, *C. grandis* x Unshu (= Satsuma) mandarin, *C. nobilis* and Natsudaidai [Summer orange] [cf. XXIX, 3051].

1160 *Furusato, K., Ohta [Ota], Y. & Ishibashi, K. Trifoliate seedlings in* Citrus. *(pp. 44–45).*

Trifoliate seedlings, varying considerably in leaf shape and size and presumed to be hybrids, were produced as a result of pollinating simple-leaved species by *Poncirus trifoliata*. Many trifoliate seedlings were obtained from selfings, open pollination and controlled crossings of the following simple-leaved forms: *C. tamurana*, *C. grandis*, *C. aurea*, *C. sulcata*, Hassaku, Yuzu, *C. aurantium*, Unshu mandarin, *C. funadoko* and Kaori mandarin.

1161 *Ohta [Ota], Y. & Furusato, K. Heteroploid seedlings in* Citrus. *(pp. 45–46).*

Heteroploids and mixoploids of Natsudaidai [Summer Orange], characterized by slender leaves, have been found [cf. XXIX, 3050]. Heteroploids with slender leaves also occurred in *C. sulcata*, *C. tamurana*, *C. aurea* and *C. kinokuni*.

1162 *Ohta [Ota], Y. & Furusato, K. Embryo-culture in* Citrus Natsudaidai. *(pp. 46–48).*

[Cf. XXIX, 3053].

1163 *Furusato, K. Study on fiber of tetraploid* Luffa cylindrica *Roem. (p. 48).*

[Cf. XXIX, 2891].

1164 *Furusato, K. A new type of bud variation in Citrus. (pp. 48–49).*

A variation consisting of an abnormal growth resembling witches' broom in cherry arose in the Unshu (= Satsuma) mandarin.

1165 *Takahashi, N. & Oka, H.-I. Observation on natural populations of Formosan wild rice particularly on variations in seed dormancy. (pp. 58–59).*

Further study has been made of *Oryza sativa* var. *spontanea* from Taiwan [cf. XXVII, 3809], information being given on the variation shown by two populations in several morphological characters and dormancy. Most lines from both populations had a much stronger dormancy than cultivated rice, degree of dormancy being significantly correlated with heading date ($r = -0{\cdot}437$) and ligule length ($r = 0{\cdot}323$).

1166 *Sakai, K.-I. & Iyama, S. Genetical studies on the cherry-red leaf in tobacco plants. (pp. 59–61).*

The pooled results of a three-year analysis of groups of lines with respect to variation in postharvest reddening showed the condition to be primarily under genetic control and independent of leaf quality [cf. XXVIII, 3882]. Cherry-red leaf was dominant in a cross between two lines respectively having a low and high incidence of the condition.

1167 *Iyama, S. Genetic correlations of agronomic characters in rice. (pp. 61–63).*

Correlations are given for (1) 19 varieties cultivated in Japan and (2) F_7 lines from Omachi x TeTep, with respect to plant height, panicle length, tiller number, panicle number, plant weight, panicle weight and 100-grain weight. Disparities between (1) and (2) in associations suggested that, in Japan, types with dwarf habit and high tillering ability have been favoured in selection, with the result of an absence of correlation between panicle length and yield and a negative correlation between tiller number and panicle length among commercial varieties. F_7 lines with long grain tended to have longer panicles and greater plant weight but grain shape bore no relationship to yield. Heritability values for (1) and (2) are also given.

1168 *Iyama, S. Variation in competitive ability among F_3 lines of the cross between an upland rice variety and "red rice." (pp. 65–66).*

On the basis of a test of Norin 18 [Ministry of Agriculture and Forestry 18] glutinous rice x red rice, it is concluded that red-rice hybrids may be expected to have strong competitive ability against upland varieties.

1169 *Sakai, K.-I. & Narise, T. Genetic variability in wild populations of* Oryza perennis *and* O. rufipogon (pp. *67–69*).

Populations of *O. perennis* and *O. rufipogon* (*O. sativa* var. *spontanea*) found in Ceylon were analysed with respect to awn length and spikelet length and width. The two species were indistinguishable on the basis of the three characters. Within each species, variation between populations was considerable. Length and width of spikelets were not genetically correlated but spikelet length was correlated with awn length.

1170 *Sakai, K.-I. & Niles, J. J. Heritability of grain shedding and other characters in rice. (pp. 69–71).*

Details are provided of the method used to compute heritability values for grain shedding, panicle length and plant height in two crosses between Ceylonese varieties [cf. XXIX. 395].

1171 *Nezu, M. & Matsumura, S. Effect of X- and γ-irradiation on chromosome aberrations in* Vicia faba. *(pp. 87–88).*

Soaked seeds were exposed to 600 r. of X or γ rays. Observations on bridges and fragments at early telophase showed X irradiation to be 1·2–1·6 times more effective than γ exposure. It was estimated that X irradiation incited about 1·7 times as many chromosome breaks as γ treatment.

1172 *Matsumura, S. Effects of temperature and irradiation time upon mutations induced by radiations. (pp. 88–90).*

[Cf. XXIX, 1361].

1173 *Fujii, T. Crosses between various X-ray induced recessive mutants in wheat. (pp. 90–91).*

[Cf. XXIX, 1363].

1174 *Fujii, T. Radiosensitivity in plants. (pp. 91–93).*

The radiosensitivity of 14 crop plants when the dry dormant grains were exposed to γ rays was determined mainly on the basis of germination rate. Intraspecific differences were noted [cf. XXIX, 3502]. In a test of *Triticum* and *Aegilops* spp., the latter genus was the more tolerant of γ irradiation of the grains. Diploid species of both genera were the most sensitive but $6x$ wheats were not more resistant than $4x$ [cf. XXVIII, 4055].

1175 *Matsumura, S. & Fujii, T. Radiosensitivity of several commercial varieties and useful mutants induced by X-rays in tobacco. (pp. 93–94).*

Intervarietal differences in tolerance of X and γ radiation were revealed by observations on germination rate of the treated seeds. Two X-ray-induced mutants of Bright Yellow exhibited improvements over the parent variety in quality and are considered to be promising for the southern districts.

1176 *Matsumura, S. & Fujii, T. Induction of bud-sports by X- and γ-rays. (pp. 94–95).*

Chimeras with respect to tuber colour and shape were obtained in the sweet potato by X and γ irradiation of tuber halves. Information is given on the effects of these radiations on sprouting in seedlings and cuttings of *Cinnamomum camphora.*

1177 *Oka, H.-I. & Hayashi, J. Induced polygenic mutations in rice. (pp. 95–96).*

[Cf. XXVIII, 4242].

1178 *Matsumura, S. & Fujii, T. Radiosensitivity and mutants in barley induced by irradiation.* (*p. 97*).

Varietal disparities were found in response to X and γ irradiation of dormant seeds, as indicated by germination and seedling survival and growth. Chlorophyll mutants such as *albina, chlorina* and *viridoalbina* appeared in the X_2, the frequency of progenies containing mutants usually increasing with dosage. At the same dosage (10 kr.), X-rays were more effective than γ in inducing such mutants. Frequency of chlorophyll mutants was highest in Early Golden Melon, Asahi 5 [Rising Sun 5] and Spratt Archer and lowest in Extra Plumage and Plumage Archer, which had the lowest survival rates.

1179 *Kondo, S., Yokota, N. & Kawashima, S. Diffusion of radioisotopes in soaked wheat seeds.* (*pp. 98–100*).

Undertaken in connexion with work on mutation, experiments are reported on the effect of the testa of *Triticum monococcum* var. *flavescens* upon the dose of P^{32}, Zn^{65}, Sr^{90} and Cs^{137} received by the grains when soaked in the radioactive solutions.

1180 *Iino, T. & Lederberg, J. Transductional analysis of monophasic types of* Salmonella. (*pp. 101–02*).

Three additional genes involved in the production of H antigen were discovered by transductional analysis of monophasic strains of *Salmonella* spp. [cf. XXVIII, 3896]. Vh_2^- causes stabilization of the H_2 state and is linked with H_2. Linked with H_1, Ah_1^- behaves as an inhibitor of H_1 activity. The function of H_2 is inhibited by Ah_2^-, linked with H_2. Both Ah_1^- and Ah_2^- are phase specific but not concerned with the specificity of antigen types, which are determined exclusively by H_1 and H_2.

1181 *Kimura, M. Chance of fixation of mutant genes.* (*pp. 102–03*).

Formulae have been worked out for (1) the general solution of the probability of fixation of a mutant gene for an arbitrary degree of dominance, and (2) the special case of an advantageous but nearly recessive mutant gene.

1182 *Kimura, M. Effect of natural selection in a finite population.* (*p. 103*).

Further to the author's analysis of the interaction between natural selection and random genetic drift, assuming complete dominance [XXVIII, 3898], formulae for the rate of steady decay are given for the more general case of an arbitrary degree of dominance.

1183 *Kimura, M. Zygotic frequencies in a partially self-fertilizing population.* (*pp. 104–05*).

Considering the case of an arbitrary proportion of cross (R) to self (S) pollination, formulae are derived for the distribution of zygotic frequencies for 1 and 2 segregating loci. It was found that, even when 2 loci are on different chromosomes, the distributions of zygotic frequencies between 2 loci are not independent under partial self-fertilization. For 2 unlinked loci with pairs of alleles in equal frequencies, departure from random combination is at a maximum when $R = 2\sqrt{3} - 3$.

1184 *Kimura, M. Overdominant genes in an partially self-fertilizing population.* (*pp. 105–06*).

If the selective values of A_1A_1, A_1A_2 and A_2A_2 are $1{-}s_1$, 1 and $1{-}s_2$ respectively, then stable equilibrium is possible if (1) $s_1, s_2 > 1/2$ and any degree of selfing, (2) $s_1 = s_2 = 1/2$ and the proportion of selfing is less than 1, and (3) at least one of s_1, $s_2 < 1/2$ and the proportion of self fertilization is less than $2s_2(1{-}s_2)/s_1 + s_2 - 2s_1s_2$; assuming that $s_1 \geqslant s_2$.

Equilibrium genotypic frequencies assuming the above conditions are worked out.

1185 *Kimura, M. On the decrease of fitness due to deviation from optimum in quantitative characters.* (*pp. 106–07*).

On the assumptions that numerous loci are involved in the determination of a normally distributed metric character and that the fitness of the individuals concerned is determined independently of the metric trait (in particular extreme deviants are taken as less fit than those around the population average), formulae are derived relating fitness to the metric trait and to its heritability.

1186 **Scientific Reports of the Indian Agricultural Research Institute for the year ending 30th June 1956 :** Pp. xxiv + 142.

Cytological technique. Excellent spread of the chromosomes was found in root tips taken from seeds soaked for 2 hr. in castor oil prior to germination.

Induced chromosome aberrations. Soaking seeds in the oil from toria or castor oil plant led to fairly extensive chromosome breakage in *Triticum monococcum, T. dicoccum, T. aestivum, Oryza sativa* and *Vicia faba.* Varying degrees of aberration were induced by coconut and groundnut oils, while linseed oil completely inhibited germination and gingelly oil and ghee had no effect.

Studies of the effects of β rays, neutrons and X rays showed that wheat was more easily affected than rye and that linseed was very insensitive to damage. The cytological effects of a given dose of β irradiation decreased from the diploid to the hexaploid wheats, but with neutrons the reverse was true, nearly all of the chromosomes in a high proportion of cells being damaged.

Wheat. Breeding for rust resistance is in progress. The varieties E671 (Cometa Klein), E957 (Fronteira), E581 (Kenya 184 P_2 AIF) and NP790 are being used to improve the disease resistance and other characters of the NP varieties 710, 718 and 775. Progenies from crosses between *Triticum aestivum* on the one hand and *T. durum* 'E931', 'E2625' and 'E2158', *T. dicoccum* 'E1928' and 'Ic1057' and *T. pyramidale* 'E2322' on the other are under study. E2842 (Yaquie* 53), W207 (Bowie), W219 (Tremez Molle) and W248 (Kenya Ploughman) have proved resistant to black, brown and yellow rusts. Resistance to the virulent new black rust race 122 was found in E572, E481, E871, E1913 and E2025. Freedom from loose smut occurred in several introduced and native varieties. E201, E56, E740 and E2327 were highly resistant to *Tilletia* spp. The three new rust-resistant strains HD(52)–46, HD(52)–66 and HD(52)–35 did well with late or early sowing, on irrigated or nonirrigated land, and under conditions of high or low fertility, HD(52)–46 being best. NP710 and other wheats have been crossed with the lodging-resistant varieties E2628 and E2629. In genetical studies, susceptibility to black rust was dominant, three crosses giving the F_2 ratio 13 susceptible : 3 resistant; in a fourth cross, three complementary genes were involved. Brown-rust resistance was dominant, one, two or three genes being involved in different crosses. Dominant yellow-rust resistance governed by one gene was found in three crosses and by three in a fourth cross. Seedling resistance to black rust was dominant, resistance to race 15 being controlled by one or two genes, to race 42 by two genes and to race 75 also by two genes. Lodging resistance was recessive and monogenically determined.

Studies of monosomics indicate that Cometa Klein carries: a recessive gene *a* for awn development and possibly some factors for chromosome synapsis on chromosome III; the recessive alleles of the awn suppressor genes *Hd* and B_2 on chromosomes VIII and X respectively; and factors for ear shape on chromosome IX.

Two new races of brown rust, one of them resembling race 70, and one new black rust race resembling race 17 have been found, also a new virulent biotype of black-rust race 21, designated 21–A.

Barley. Freedom from black rust after inoculation was found in 28 introduced and 20 Indian barleys; several were also free from yellow rust. Resistance to loose smut occurred in B47 (Afghanistan–1), B237 (B114 Roseworthy Oregon) and B240 (Ko. Sr.40/13 Svalöf Yemer†). C141, B137, B148 and B229 showed a considerable degree of lodging resistance. There appear to be at least two physiological races of leaf rust in India.

Grasses. The production of inbreds of *Pennisetum typhoides* is under way and top crosses of S_1 lines have been effected. Two variants without pistils have been found. Selection continued in species of *Cenchrus*, *Pennisetum*, *Dichanthium*, *Heteropogon* and *Chrysopogon*. While *Ch. montanus* failed to set seed when selfed, *Dichanthium annulatum* and species of *Cenchrus* and *Pennisetum* gave good seed sets and their S_1 and S_2 generations showed no depression in vigour. Intraspecific polyploidy has been observed in *Sehima nervosum*, *Bothriochloa ischaemum*, *B. intermedia*, *Dichanthium annulatum* and *Themeda anathera*. B chromosomes were seen in *Panicum coloratum* and *Chrysopogon gryllus;* the presence of three or more B chromosomes led to disturbed anaphases and some degree of pollen abortion. *Brachiaria brizantha*, a promising fodder grass under Delhi conditions, proved to be triploid and sterile. The chromosome numbers $2n = 10$ and $2n = 32$ in *Pennisetum ramosum* and *P. massaicum*, respectively, suggest the additional basic numbers $x = 5$ and $x = 8$ for the genus.

Forage legumes. Cytological studies of C_1 plants of *Trifolium alexandrinum* revealed an average of 2·3–2·8 quadrivalents per cell. Seed was lower than in the diploids but this was offset to some extent by the greater inflorescence number; the tetraploids were also more vigorous and had a higher Ca content.

In *Melilotus indica*, autotetraploids had 3·0 quadrivalents per cell and were poorer in growth and vigour than the corresponding diploids.

Cotton. To improve their staple length and other fibre properties, the lines 216F and 216F–14, which are suitable for the Delhi tract, have been crossed with various *Gossypium hirsutum* types. The F_1 hybrid 216F x Co.2 showed marked heterosis for the third year in succession, yielding about 30% more seed cotton than 216F, without decrease in ginning outturn or halo length. Dhar Cambodia, Buri (CP) American, Parbani American and Indore 2 and the interspecific Indo-American hybrids 170 x Co.2 and 134 x Co.2 were completely immune from small leaf.

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* ? Yaqui,

† ? Ymer.

Sugar cane. Differences in virulence but not in specificity were found among 28 isolates of *Colletotrichum falcatum* (*Physalospora tucumanensis*). Among 96 varieties tested by the nodal infection method, one, SG227/9, proved resistant. Resistance to smut occurred in some varieties.

Oil crops. Seed fertility has been much increased in autotetraploid populations of toria by mass pedigree selection. Calculations of the hybridity coefficients from chromosome inversion data in F_2 hybrids involving toria on the one hand and yellow sarson, brown sarson and Burma sarson on the other indicated that, of the three sarsons, brown sarson is the most closely related to toria. The varying degree of fertility in the F_2 populations suggested that, apart from the inversions, the differences between toria and the three sarsons are largely of the cryptic structural type.

NP6 and some selections from *Sesamum orientale* x *S. prostratum* withstood heavy rains in September and wilt caused by *Macrophomina phaseoli* better than nearly all introduced and indigenous types.

The early-maturing, rust-resistant linseed selections S20, S4, S7, S63, S3, S2, S38 and S71 outyielded the best control by 20–50%. In autotetraploids, an increase in fertility through selection was observed only in NP(RR)63. *Linum mysorense* was found to possess $2n = 60$. *L. trigynum* proved immune from all five Indian rust races. NP Hyb.10 was resistant in the seedling and adult stages and many other varieties in the adult stage.

Tomato. Promising performances have been obtained from lines of Sioux x Improved Meeruti x Red Cloud, hybrid 10 being particularly good in early and total yields, quality and hardiness. F_1 hybrids of Improved Meeruti x Sioux showed marked heterosis; the reciprocal did less well. Male sterility is now being used in the production of hybrids.

Egg plant. The indigenous variety Wyanad Giant (IC3517), which has attractive, dark purple, round fruits, has been crossed with Pusa Purple Round.

Hibiscus. The F_1 of *H. tuberculatus* ($n = 29$) x *H. ficulneus* ($n = 36$) had $2n = 65$ and was totally sterile with an average of 1·6 chromosome pairs per cell, while the F_1 of *H. manihot* var. *tetraphyllus* ($n = 69$) x *H. esculentus* ($n = 65$) had $2n = 134$ and was also sterile, but had 20–42 chromosome pairs per cell. In the back cross of *H. esculentus* x *H. tuberculatus* to *H. esculentus*, 3–11 trivalents and 54–65 bivalents were found per cell; the back cross was partially fertile.

Pigeon pea. Wilt incidence in 64 early, high-yielding lines from NP51 x UP type 132, Brazil x NP41, NP51 x Jamaica 40–28B and NP(WR)15 x NP51 ranged from 0·0 to 10·2%. Some lines yielded 30–100% more than the best control. Lines from Brazil x NP41 and NP51 x Jamaica 40–28B equalled EB3 and EB38 in earliness.

Annual Report for 1958–1959 and Minutes of the 1959 Annual Meeting of the Canadian Seed Growers' Association Incorporated held at The University, Saskatoon, Sask., June 17, 18, 19, 1959 : Pp. 71.

1187 *Stevenson, T. M. Some contributions of the plant breeder to Canadian agriculture.* (*pp. 16–20*).

A general review is given of contributions made to agricultural plant breeding by the Canadian Seed Growers' Association over the last fifty years.

1188 Servicio Cooperativo Interamericano de Agricultura. Informe Anual 1958. (**Inter-American Cooperative Service for Agriculture. Annual report, 1958**). Guatemala : Pp. 160. (Mimeographed).

In addition to the work referred to below, breeding is being continued in coffee, cacao, tomato and *Phaseolus* [cf. XXIX, 1302].

Wheat. Selection for rust resistance continued, and the induction of mutations by X-rays and thermal neutrons in Supremo 211 is being studied. In regional trials the variety 2809–4B has generally yielded most.

Maize. In the hot zone, Rocamex V-520C, which is susceptible to dwarfing virus and ear rot, has been subjected to recurrent selection and used to produce a number of S_1 lines; the material obtained is being tested for combining ability. Sixteen new varieties and hybrids were released in 1957–58. Synthetics developed for the intermediate zone failed to show an appreciable increase in yield over local varieties but have a very much shorter vegetative period.

In the cool zone, crossing, selfing and selection are in progress for the production of hybrids and synthetics.

Potato. When first grown in Guatemala, Kennebec was immune from *Phytophthora infestans*, but after two years it became susceptible, indicating that a new race of the pathogen had appeared. Samples of *Solanum demissum*, *S. morelliforme* and *S. bulbocastanum* have been added to the Guatemalan collection.

Hevea. Further crosses between eastern mother clones susceptible to the South American leaf disease and resistant pollen parents from Brazil have been effected. Selection of wild trees is in progress.

1189 Informe anual de labores 1957. (**Annual report of activities, 1957**).
Ministerio de Agricultura e Industrias, San José, Costa Rica 1958 : Pp. 116.

Testing and selection of oat and rice varieties and of 23 species of potato are in progress. In maize, high yields have been obtained from the white intervarietal hybrids Rocamex V–520C x Eto Blanco [White Eto], Sicarigua Majorada [Improved Sicarigua] x Eto Blanco and Rocamex V–520C x Rocol V–101 and the yellow hybrids Venezuela–1 x Cuba–45, Cuba–11 x Eto Amarillo [Yellow Eto] and Cuba–45 x Eto Amarillo; the first mentioned white hybrid is a semident type of good grain quality.

1190 Informe anual de labores, 1958. (**Annual report of activities, 1958**).
Ministerio de Agricultura e Industrias, San José, Costa Rica 1959 : Pp. 145.

In addition to the work referred to below, varietal trials of sugar cane, cacao and coffee have been carried out.

Maize. Material from the three crosses I-452 x Zorca, Rocamex V–520C x Eto Blanco and Cuba–11 x Eto Amarillo has shown promise.

Rice. The introduced variety Dima is good in quality and is suited to soils which become waterlogged with the onset of the wet season. Two promising selections from Hill Sel. x Bluebonnet CI9108 and Hill Sel. x (TP x R–SBR) both have long fine grains, are good in milling quality, resist lodging and shattering and mature in 90 days, allowing early sowing in May and harvesting in the dry period in August. Twenty lines with low susceptibility to hoja blanca [white leaf], 12 lines resistant to *Helminthosporium oryzae* (*Cochliobolus miyabeanus*) and *Piricularia oryzae* and 20 lines resistant to white streak have been identified and are being studied. Lines with good agronomic characteristics and exceeding the standard Bluebonnet 50 in yield have been developed.

Potato. From among 3226 clones tested for blight resistance, 63 resistant clones with well-shaped tubers and good yields have been selected. Tests for resistance to both cold and blight are being conducted on 22 South American species.

Carnegie Institution of Washington. Year Book No. 57 : 1957–1958 : Pp. 497.

1191 *Clausen, J., Hiesey, W. M. & Nobs, M. A. Poa investigations. (pp. 272–78).*

Experiments undertaken in cooperation with the US Agricultural Research Service to test the responses of apomictic strains of biparental interspecific hybrids of the parental species in a wide diversity of environments throughout the USA were completed. The observations have emphasized the intricacy of the role played by the balance between heredity and the environment in determining the success of strains, this balance making it necessary to breed strains suitable for specific areas. Some biotypes, however, appear to be physiologically buffered so as to tolerate highly diverse environments. They may be produced by combining the genotypes of races adapted to contrasting environments, as has been realized in a number of *P. ampla* x *P. pratensis* hybrids [cf. XXVIII, 3948]. Quadruple F_1 hyrids of (*P. scabrella* x *P. pratensis*) x (*P. ampla* x *P. pratensis* var. *alpigena*) have also been studied. They possess morphological characters of the four parents and the various strains have shown a wide range of tolerance of different environmental conditions at the three transplant stations where they have been grown since 1953. Open pollination of this combination has resulted in apomictic and sexual progenies. The sexual progenies were fertile when pollinated by additional species; the limit of combining genes from various species does not therefore appear to have been reached. In addition, hybrids involving amphimictic species have received attention. F_1 *P. pratensis* ($2n = 68$) x *P. caespitosa* ($2n = 56$) was completely sterile. F_1 *P. compressa* ($2n = 42$) x *P. caespitosa* was vigorous and moderately fertile but the F_2 population was exceedingly weak. F_1 *P. caespitosa* (hermaphrodite) x *P. arachnifera* ($2n = 56$, diecious) was moderately vigorous at Stanford, Calif., but clones transplanted to mountain stations soon died. F_2 survivors at Stanford possess excellent vigour, the morphological influence of *P. caespitosa* being prevalent. Segregations indicate that the hybrid is sexual and suggest that the chromosomes of the parental species pair predominantly among themselves.

1192 *Hershey, A. D.* et al. *Growth and inheritance in bacteriophage.* (*pp. 379–86*).
The main findings included the following. (1) Results from T2 crosses were consistent with the hypothesis that frequency of recombination is proportional to number of generations of DNA replication in a pool of replicating and mating chromosomes, and that neither replication nor recombination is suppressed by chloramphenicol, the presence of which suppresses protein synthesis. (2) In a bacterium in which chromosomal replication initiated by a phage of one genotype is already under way, chromosomal replication of a superinfecting phage of a second genotype may begin without additional protein synthesis. (3) In order to account for both multiplicity reactivation of ultraviolet-irradiated phage and the effect of this irradiation on recombination frequencies in phage crosses, a group-mating hypothesis of genetic recombination and a copy-choice hypothesis of chromosomal replication appear to be required. [Cf. XXIX, 3348].

1193 *Campbell, A. & Balbinder, E. Properties of transducing phages.* (*pp. 386–89*).
Segregational analysis strengthened the view that transduction of the *gal* region in *Escherichia coli* by phage is a matter of lysogenization by particles which are not true bacteriophage, containing, apparently within a phage skin, an incomplete phage genome and the *gal* region. Evidence was obtained that a particular λ *gal* genome multiplies true to type. [Cf. XXIX, 2182 and 3353].

1194 *Demerec, M.* et al. *Bacterial genetics.* (*pp. 390–406*).
Recombination among alleles at the linked loci *tryA*, *tryB*, *tryC*, *tryD* and *cysB* in *Salmonella typhimurium* was analysed in transduction experiments, the results of which have been fully reported elsewhere [XXIX, 3350]. "Second-round" transduction occurred in *S. typhimurium*, as had been previously discovered in *Escherichia coli*. Genetical and biochemical studies were carried out on 168 proline-requiring mutants. By means of transduction tests, four loci were detected, *proA*, *proB*, *proC* and *proD*, the first two being closely linked. Seven of the proline-requirers were multisite mutants, involving in some cases sites of one locus and in others sites of two loci. None of the seven mutants underwent spontaneous or ultraviolet-induced reversion. Probably they arose through chromosomal aberration. Tests with 9 *proA*, 16 *proB* and 3 *proC* mutants indicated that they all depended on different sites within the relevant locus. Transduction tests gave the following results concerning other biochemical mutants. Leucine-requiring mutants constitute a single linkage group, locus *leuA* also being linked with *araA* and *araB* for arabinose utilization. Five loci (*ileA*, *ilvaA*, *ilvaB*, *ilvaC* and *val*) controlling synthesis of the biochemically closely related compounds isoleucine and valine form another linkage system. Four loci responsible for threonine synthesis are linked with one another and with *serB* for serine requirement.

Transduction of the locus affecting colicinogenicity has been accomplished in both *S. typhimurium* and *E. coli.*

S. typhimurium 'LT–7' apparently carries a gene enhancing frequency of mutation in both directions, from wild type to auxotroph and from auxotroph to wild type. The gene has been found to have this effect upon at least ten loci. Work on reversion of auxotrophs has indicated that alleles at the same locus very commonly differ in mutability, both spontaneous and induced. Mutagen-stable alleles capable of spontaneous mutations but showing no increase in frequency of reversion as the result of treatment with various mutagens have been detected. It appears probable that within a locus sites corresponding to mutagen-stable and mutagen-labile alleles are arranged in mixed order. In *S. typhimurium*, 57·1% of 163 auxotrophs were mutagen stable, as against only 14·3% of 35 *E. coli* auxotrophs. In both species, mutagen-stable alleles are evidently of general occurrence among loci affecting biochemical behaviour.

Suppressor mutations responsible for small-colony "reversions" of tryptophane requirers of *S. typhmurium* were found for each of the loci *tryA*, *tryB*, *tryC* and *tryD*. Data on *tryD* mutants indicated that the suppressor mutations were specific as regards the *tryD* alleles and were situated at a locus not closely linked with *tryD*. Analysis of spontaneous and ultraviolet-induced mutants provided additional evidence that the specificity of the tryptophane-requirers with respect to mutability resides in the allelic site, not in the gene locus. For example, in *tryD*–6 both true reversions (large colonies) and suppressor mutations were induced with about equal frequency; in *tryD*–1 suppressor mutants were induced considerably more often than reversions; and in *tryD*–7 no reversions were induced but the rate of induction of suppressor mutations was very high.

Transduction experiments on *E. coli* were focused on markers in the region *thr ara leu azi–r pan T*1,5–*r*. Most of the results could be interpreted by assuming that the fragments participating in transduction of a given marker are not uniform but represent more or less random portions of the corresponding region of the chromosomes of the donors. According to transduction tests, streptomycin resistance and dependence in *E. coli* were under the control of one gene or two closely linked genes. At least some of the resistant and dependent mutants have been multisite. "Reversion" from dependence to nondependence (sensitivity or resistance) was due to mutation at a suppressor locus, closely linked to the locus or loci for resistance and dependence.

Applying transduction techniques, resistance to chloramphenicol or penicillin in *S. typhimurium* was found to be polygenically determined [49]. Transformation experiments on streptomycin resistance in *S. typhimurium* were highly successful. About 50% of the transformants required thiamin for growth. Transduction tests revealed that this requirement was due to mutation at locus *thi*, which is closely linked with *str–r* for streptomycin resistance. This finding confirmed a previous observation that markers not present in the donor may be introduced into recipients by transforming DNA. Such markers presumably represent mutations induced in the DNA during extraction.

1195 *Kaufmann, B. P., Gay, H., Fuscaldo, K. & Buchanan, J. The nature of the materials of heredity.* (*pp. 406–12*).

Research on biological ultrastructure by cytochemical and electron-microscopic methods continued. Use was made of *Drosophila* in the investigations reported. Data afforded by radioautographic and other techniques have suggested that DNA is attached laterally to component strands, probably protein, which form the main axis of each of the constituent chromonemata. By means of enzymatic hydrolysis, further evidence has been obtained that chromosomes contain RNA at all stages of mitosis. From a theoretical consideration of the role of blebbing in salivary gland cells, it is concluded that many aspects of gene action may be brought into perspective when viewed in terms of the coordinating properties of the nuclear membrane. A beginning has accordingly been made in the analysis of the problem of gene action by means of the electron microscope. RNase is being studied as a possible mutagen. The effect of infra-red treatment on crossing over was further investigated. This agent largely eliminated the interference normally occurring between cross overs in two adjoining regions.

1196 *McDonald, M. R. & Karossa, J. Intracellular deoxyribonucleases.* (*pp. 412–15*).

The precise role of intracellular deoxyribonucleases in DNA synthesis and cell division cannot be determined until they have been isolated and characterized. Work has therefore been concentrated on ascertaining the best procedures for extracting and purifying intracellular deoxyribonuclease of salmon testes, a tissue found to be a very prolific source of this group of enzymes.

1197 *McClintock, B. The suppressor-mutator system of control of gene action in maize.* (*pp. 415–31*).

As already reported [cf. XXVIII, 3954], the *Spm* (Suppressor-mutator) system controls gene action at loci a_1^{m-1} and a_2^{m-1} for anthocyanin production in plant and kernel. In the case of a^{m-1}, confirmable predictions could be made as to the phenotypes of plants and kernels with or without *Spm*. The pattern of control in plants carrying a_2^{m-1} was however perplexing. Further work has indicated that in a_1^{m-1} cultures *Spm* is active throughout the development of plant and kernel and stable in its operation. In a_2^{m-1} cultures, however, *Spm* undergoes cyclical changes in action. The alternation of active and inactive phases during development results in many diverse patterns of anthocyanin pigmentation, both in different parts of the plant and in different individuals. When the stable *Spm* from a_1^{m-1} plants was introduced in a_2^{m-1} cultures having no *Spm*, the orderly patterns of expression characteristic of a_1^{m-1} were observed.

Study of the transposable modifier component causing increase in the rate of mutation of a_1^{m-1} [cf. *loc. cit.*] revealed that its expression was the same whether standard *Spm* or *Spm–w* was present and that in the absence of the modifier the distinct patterns of mutation at a_1^{m-1} incited by these two states of *Spm* were clearly expressed.

In further investigations on the transposition of *Spm* it was found that the progeny of plants with "early-occurring" transpositions continued to exhibit such changes. No evidence has so far been obtained that a directed type of transposition in which *Spm* returns to its original position is of regular occurrence.

Conferencias 1957–58. **(Lectures, 1957–58).**
Instituto Nacional de Investigaciones Agronómicas, Madrid 1958 : Pp. 107.

1198 *Prieto Heraud, E. El registro de variedades y la selección de semillas en Norteamérica. (Varietal registration and seed selection in North America). (pp. 45–54).*
The organization of varietal registration and seed production in the USA is outlined.

1199 *Puerta Romero, J. Trabajos de mejora de judías y sojas en los Estados Unidos. (Breeding work with French beans and soya beans in the United States). (pp. 55–81).*
In this report of a study trip to the USA, work on French beans in progress at Michigan State University, Beltsville Plant Industry Station, Md., and stations in other states and on soya bean in Illinois and Indiana is briefly surveyed.

Abstracts of the Annual Meeting of the American Society of Agronomy, Cincinnati, Ohio 1959: Pp. 98.

1200 *Adams, M. W., & Shank, D. B. The relationship of heterozygosity to homeostasis in maize hybrids. (p. 53).*
Homeostasis of height and weight characters was determined in eight groups of hybrids representing a wide range of heterozygosity, data being obtained on 34 hybrids in 1956 and 40 in 1957 in two localities. Homeostasis was highly related to the calculated degrees of heterozygosity of the groups. In most cases significant differences were detected between hybrids within degrees of heterozygosity. In explanation of these findings, three interpretations are considered: "(1) the alternative pathway or complex enzyme hypothesis; (2) the heterozygous balance hypothesis; and (3) the components hypothesis."

1201 *Anderson, R. E. Breeding behaviour of the creeping-rooted trait in alfalfa. (p. 53).*
Breeding for an adapted creeping-rooted type at Cornell University has been carried out from F_1 to F_4 by selection and intercrossing of superior plants in each successive group of progenies. The basic germ-plasm included four creeping-rooted clones from Canada and five C clones. All progenies were studied as spaced plants. The frequency of creeping plants has increased in each generation, with F_3 progenies averaging 63% after two years in the field and 95% after three years. F_4 progenies contained 30% creeping plants at the end of the first year, this being the highest percentage found in any generation at the end of this growth period. Early ability to produce auxiliary plants from underground lateral roots was closely associated with vigour of the young plant. Selfed progenies of profusely creeping F_2 individuals had 27% creeping plants after two years and 72% after three years. Precociousness of creeping habit was indicative of high frequencies of creeping plants in subsequent progenies. The character of creeping roots is dominant, with inherent vigour influencing time of expression.

1202 *Anderson, R. E. & Webster, O. J. Factors contributing to yield in sorghum hybrids. (p. 53).*
With a plant spacing of 6–12 in., the advantage in yield of hybrids over varieties was due to a combination of greater number of heads per plant and greater weight of grain per head. With a higher density of population, the superiority of the hybrids was mostly due to greater weight of grain per head. In some tests the yield advantage of the hybrids decreased as populations and yields per acre increased. Seed weight per 1000 kernels in the hybrids was no greater than in the varieties, increase in grain weight per head being due to increase in seed number.

1203 *Barker, L. N. & Shands, H. L. Height and other plant character inheritance in barley crosses made for shorter-strawed types. (p. 53).*
Progenies of the following were studied: Moore x CI1374, Colsess IV x CI1374, Kindred x CI2319, Lion x CI2319 and Jet x CI2319. CI1374 and CI2319 appear to be identical, being short, naked, rough-awned varieties possessing the *uzu* [semibrachytic] character. Rough *v.* smooth awn, normal *v. uzu*, naked *v.* covered caryopsis, black *v.* white hull and two rows *v.* six were apparently under the control of single, independent pairs of genes. "Preliminary analyses indicated that in most cases, height, spike length, and spike denseness were conditioned by 2 or more factors. The presence of a dominant major factor was indicated. The inheritance of rachis internode length appeared to be more complex in the cross involving Moore than in other crosses. Some plants with reduced height have been backcrossed to Moore and to Kindred. Selections from these backcrosses have shorter straw than the recurring parents. Several F_3 lines were also considerably shorter than the tall parents and appeared productive."

1204 *Beachell, H. M. & Atkins, J. G. Breeding rice for resistance to the virus disease hoja blanca. pp. 53–54).*

During 1957 in Cuba and Venezuela, several thousand varieties and selections were tested for resistance to white leaf, an insect-transmitted virus disease. All leading American varieties were susceptible but many entries of the *japonica* type were resistant. Breeding was initiated at Beaumont, Tex., with CI9416, a smooth-hulled, medium-grained selection, and PI215936, a short-grained introduction from Taiwan, as sources of resistance. The hybrid derivatives are being tested in Cuba, Venezuela, Colombia and Costa Rica. Preliminary data suggest that resistance can be transferred to adapted varieties of all grain types.

1205 *Brim, C. A. & Cockerham, C. C. Inheritance of quantitative characters in soybeans. (p. 54).*

The F_3, F_4 and F_5 of each of two populations were obtained by advancing, in bulk, 120 randomly chosen F_2 plants from a cross of two homozygous lines. In each population, paired F_3 lines were crossed "so that an F_2 ancestor was involved at random in only one cross." Seeds obtained by crossing two F_3 lines were used as bulk to produce the "F_{3C}" generation. The F_3–F_5 and F_{3C} of the two populations were grown in replicated trials at two centres for two years. Estimates of genotypic variance among progenies within generations and of genotypic covariance between generations were made. Four variance and six covariance components were thus available for each character in each population. Genetic models were fitted to the data, using least squares procedures. A completely additive model accounted for 90% or more of the variation among estimated variance and covariance components for all characters except yield and unthreshed weight in both populations and "fruiting period and maturity" in one population.

1206 *Burton, G. W. & Jackson, J. E. Radiation breeding of Dallisgrass,* Paspalum dilatatum *var.* pauciciliatum. *(p. 54).*

Seeds of this highly apomictic variety were treated with 15 and 20 hr. doses of thermal neutrons and 20,000 and 30,000 r. of X rays. Numbers of vegetative R_1 off-types per 1000 spaced plants among the controls and plants from seeds receiving the different treatments were respectively 80, 206, 346, 110 and 239. Floral off-types per 1000 plants respectively numbered 30, 59, 125, 34 and 77. Ergot resistance was not shown by any R_1 or R_2 plants. Off-types in R_2 progenies bred true in the R_3, proving that off-types had arisen through sectoring and that apomixis had not been affected. One R_2 progeny from seed treated with thermal neutrons for 15 hr. significantly outyielded the controls.

1207 *Carlson, I. T. & Moll, R. H. An analysis of variability in quantitative characters in strains of orchardgrass. (p. 54).*

As the initial step in cocksfoot breeding at the North Carolina State College, the nature and extent of variability within and among 174 seed sources were studied during 1957 and 1958 in spaced plantings at two centres. Individual plants were scored for vigour three times during each season and also for maturity, panicle number, leafiness, greenness and reactions to *Puccinia graminis*, *Scolecotrichum graminis* and *Stagonospora maculata*. For most traits, a wide range of mean performance was found. Estimates of the percentage genotypic variance within lines were made, using clonal lines to estimate environmental variation. Relationships between characters were studied by calculating phenotypic and genotypic correlations for all possible pairs of characters. Components of variance for strains and strain x environment interactions were also determined.

1208 *Carnahan, H. L.* et al. *General and specific combining ability for seedling vigor and fall growth habit in diallel crosses of 14 alfalfa clones. (pp. 54–55).*

Seed from 91 F_1 single crosses made between 14 clones in all possible combinations was sown at one centre in each of five states. Seedling vigour was scored at three centres and autumn growth habit at four. Variance analysis for seedling vigour indicated that the variances associated with general and specific combining ability were highly significant for each locality and for localities combined. Variances for general combining ability were much larger than those for specific. The interaction general combining ability x locality was highly significant, its variance being similar in magnitude to the variance association with specific combining ability. The interaction specific combining ability x locality was relatively small but highly significant. Analysis of variance for autumn growth habit indicated variance relationships similar to those found for seedling vigour. The two characters were positively correlated within localities.

1209 *Chaplin, J. F. & Mann, T. J. Interspecific gene transfer and chromosomal substitution in* Nicotiana. (*p. 55*).

The recessive marker characters yellow-green (*yg*) and "burley" (yb_1yb_2) of *N. tabacum* seedlings were used in a study of interspecific gene transfer and chromosome substitution. Each donor species contained one or more *Yg* and *Yb* genes for normal green seedlings. For the initial crosses, autotetraploids ($4n = 96$) of the *N. tabacum* marker stocks were used, all back crosses being made to diploid recessive markers ($2n = 48$). Genetic ratios in the BC_1F_3 indicated that transference of genes for normal seedlings from *N. sylvestris*, *N. otophora* and *N. tomentosiformis* had been effected without difficulty. Segregation in the BC_2F_2 provided evidence of substitution by a chromosome carrying *Yg* from *N. paniculata*, *N. plumbaginifolia* or *N. rustica*. Selfed substitution heterozygotes gave in each case segregation ratios which were indicative of little or no pairing between the alien chromosomes and their *N. tabacum* partners.

1210 *Christie, B. R. & Kalton, R. R. Variation, inheritance, and recurrent selection for seed weight in bromegrass.* (*p. 55*).

In one group of clones mean seed weight ranged from 0·71 to 1·30 g. per 300 seeds and in another from 0·60 to 1·26 g. Inbred progenies of ten clones from group I were evaluated for seed weight, fertility, seed yield and flowering date. Mean inbreeding depression in seven comparisons between the S_0 and S_1 was 21% for seed weight and 53% for seed yield, and respectively 19% and 66% for these characters in three S_2–S_3 comparisons. Each progeny segregated for seed weight and seed yield but few superior segregates were found. Progeny-parent regressions were all highly significant, being respectively 0·39, 0·39, 1·19 and 0·78 for seed weight, seed yield, fertility and flowering date. Progeny-parent correlations ranged from 0·83 to 0·94. Study of polycrosses from the ten best and ten lowest clones with respect to seed weight in group II showed that, after one cycle of recurrent selection, the range in seed weight (0·44–1·62 g. for 300 seeds) was about double that in the original material.

1211 *Clement, W. M. (Jun.) & Stanford, E. H. A mechanism for the production of tetraploid and pentaploid progeny from diploid x tetraploid crosses in alfalfa.* (*p. 55*).

Abnormal cytocinesis in a dihaploid resulted in microspores containing 2, 3 or even 4 muclei in addition to uninucleate microspores. By the time of pollen maturation most of the functional gametes contained 16 or 24 chromosomes. Consequently most of the progeny from dihaploid x tetraploid were either tetraploid or pentaploid. Abnormal cytocinesis may also possibly affect the embryo in the dihaploid sac. Genetical study of F_1 diploid from dihaploid x diploid indicated that abnormal cytocinesis occurred in embryo-sac development, although microsporogenesis was more nearly normal than in the dihaploid. As yet no evidence of abnormal cytocinesis in normal diploids has been obtained, although crosses of diploids with tetraploids behave similarly in that tetraploid offspring are frequently produced.

1212 *Coleman, O. H., Stokes, I. E., Dean, J. L. & Broadhead, D. M. Preliminary report on hybrid vigour studies of sorgo.* (*p. 55*).

Many of the F_1 hybrids from 78 sorgo crosses tested at Meridian, Miss., and Beltsville, Md., in 1958 showed hybrid vigour in number of tillers, height, plant weight and stalk weight but in some cases increases in height and weight were associated with increased lodging. Date of maturity was usually near that of the later-maturing parent and in some cases later than that of either parent. It is stated that the influence of hybrid vigour on juice quality (total soluble solids) and disease resistance was also studied.

1213 *Cooper, R. L. Hybridization in* Vicia. (*p. 56*).

Fertility in interspecific hybridization was investigated to determine the feasibility of transferring disease and insect resistance to *V. villosa*. Strong barriers to interspecific fertility were found, although hybrids between *V. sativa* and *V. calcarata* were secured. Techniques of embryo culture and polyploid induction were studied in preliminary experiments on species.

1214 *Crowder, L. V. Variation within and among varieties and selections of red clover in Colombia.* (*p. 56*).

In a survey of potential breeding material, 20 varieties were evaluated in plots and as individual plants. Classification as to type was made on a scale of 1 to 5, ranging from a complete rosette to a type with all the stems producing flowers. The varieties differed in the types of which they consisted.

1215 *Curtis, B. C. & Schlehuber, A. M. Genetics of greenbug resistance in wheat.* (*p. 56*).

Crosses involving aphid-resistant Dickinson

Selection 28A and CI9058 and susceptible Ponca, Concho and Crockett indicated that resistance was controlled by a single recessive gene in both the first-mentioned varieties. F_1 plants, although susceptible, survived 7–14 days longer than the susceptible parents, susceptibility thus being incompletely dominant. All hybrids from Dickinson Selection 28A x CI19058 were resistant.

1216 *Davis, R. L. & Panton, C. Measures of general and specific combining ability in alfalfa.* (*p. 56*).

Progenies of four clones, two selected for high and two for low phenotypic performance, were studied. The single crosses, S_1s and polycrosses were evaluated for yield and yield components. Variances of polycross means for mature plant yield, components of yield and seedling height were not significant. Variances of the means of the S_1s and single crosses for these characters were however highly significant. The yield of the best single cross was 36% higher than the expected yield of the synthetic of the four clones. Clones with the best phenotypic performance generally gave rise to the most productive progenies. In addition, clones having the most productive S_1s gave the best single-cross performance.

1217 *Dirks, V. A., Harpstead, D. D. & Grafius, J. E. The development and utilization of rye populations derived by a limited isolation breeding system.* (*p. 56*).

"The inbreeding technique began with random paired rows of unselected single plant progenies drawn from one population. Each pair was separated by 6 feet from the next. The heads of the two rows in each pair were brought into close proximity at pollination time by means of twine enclosure. The mass effect of pollen arising within the pair as compared to that produced elsewhere in the field was assumed to substitute for isolation through bagging. Seed yields of each individual row were taken. High and low yielding rows were used in another cycle of breeding, for the making of topcrosses and the production of 5-progeny synthetics. The topcross and paired-progeny derivatives were tested at optimum yield levels in 1958. Topcross and 'single cross' arrays gave similar results in ranking individual original progenies, indicating that the direct increase of a high yielding progeny pair may be a feasible and economic breeding method in rye."

1218 *Dollinger, E. J. Mutation and crossing-over relationships involving a mutable system in maize.* (*p. 57*).

In tests of $Ypb/y^{m}pb^{m}$ x $y^{m}pb^{m}$, no crossing over between $y^{m}pb^{m}$ and YPb was detected (superscript ^{m} denotes mutable). Ear sectors of premeiotic mutations (yellow endosperm) were found in homozygous $y^{m}pb^{m}$ material. Forty-one plants raised from such sectors were all green, indicating that mutation from y^{m} and pb^{m} acts as a unit in inheritance, affecting the expression of pb_1 ("piebald" plant) and y_1 (white endosperm). In tests of the combination with a high mutation rate of the $y^{m}pb^{m}$ unit to the dominant condition, crossing over between this unit and su_2 was about 20%. In control tests of $YpbSu_2/ypbsu_2$ x $ypbsu_2$, crossing over between Y and Su_2 was about 29%. No chromosomal aberrations were found which might account for the difference in crossing-over values. A $YPbSu_2/y^{m}pb^{m}su_2$ plant (high mutation $y^{m}pb^{m}$) was crossed with homozygous $ypbsu_2$. Tests of the $YpbSu_2/ypbsu_2$ progeny indicated 22% crossing over between Y and Su_2.

1219 *Drolsom, P. N. & Kaufmann, M. J. Evaluation of bromegrass strains for reaction to seedling pathogens.* (*p. 57*).

Differences were found among varieties and synthetics of *Bromus inermis* in reaction to *Pythium* sp., *Fusarium* sp. and *Helminthosporium sativum* (*Cochliobolus sativus*).

1220 *Duvick, D. N. Effect of fertilizer applications on degree of pollen sterility of partially fertile cytoplasmic male-sterile corn.* (*p. 57*).

Four partially fertile single crosses carrying ♂-sterile cytoplasm had an average of 17% pollen-shedding plants when N fertilizer was applied in various combinations with potash and phosphate but an average of 37% when N fertilizer was omitted. Two hybrids had S cytoplasm and the other two the T type, but all four hybrids gave the same type of differential response to date of planting.

1221 *Everett, H. L. & Walden, D. B. Some applications of the in-vivo measurement of corn pollen viability.* (*p. 57*).

Viability of samples of maize pollen may be estimated in an assay involving an aliquot of a sample used for a pollination, K being number of kernels resulting from the pollination. K data indicated that it is possible to maintain a low percentage of viability for as long as 200 hr. after collection, with storage at — 5° to 5° C. Longevity was markedly influenced by time of collection and by treatment after collection. The treatment after collection so far found most effective includes a 1–3 hr. period of cooling (40°–60° F.) prior to storage at — 5° to 5° C.

1222 *Everson, E. H. Inheritance of plant height in wheat.* (*p. 57*).

Parental, F_1, F_2 and back-cross populations of five crosses of varieties with heights ranging from 18 to 42 in. provided data on height which were analysed by both IBM equipment and an electronic digital computer. Frequency distributions in all the populations were continuous, the parents of each cross differing by a number of genes for height.

1223 *Forbes, I. (Jun.), & Wells, H. D. The inheritance of resistance to anthracnose in blue lupine.* (*p. 57*).

According to data from a cross between a sweet susceptible line and bitter resistant line, resistance to anthracnose (*Glomerella cingulata*) depended on a single dominant gene (*An*). Some deficiency occurred in the number of individuals in the resistant sweet class in the F_2 but was not of sufficient magnitude to indicate substantial linkage between the genes for resistance and sweetness.

1224 *Frakes, R. V. Predicting dry matter yield in space planted alfalfa by height, width, and longest stem measurements.* (*p. 58*).

A partial regression predictive equation for dry-matter yield was estimated from an F_2 of 308 spaced plants. The independent variables were plant width and height, and length of the longest stem. The equation was applied to 15 other segregating S_1, F_1 and F_2 populations. Differences between expected and observed dry-matter yields per plant ranged from 0·12 to 9·84 g. Only one predicted value differed from the observed by more than the standard error of the estimate. This exceptional prediction was obtained from an F_1 family showing hybrid vigour for yield and leafiness but not for the variables used in the equation. The equation was not applicable to clonal populations.

1225 *Franzke, C. J., Ross, J. G. & Sanders, M. E. Diploid mutants in sorghum induced by colchicine treatment of seedlings.* (*p. 58*).

Many of the diploid mutants induced by treating germinating seeds of lines Experimental 1 and Experimental 3 with 0·5% colchicine have been true breeding while others have segregated when selfed. Study of the factors influencing induction of the mutants suggests that their origin may be contingent upon the degree of retardation in growth caused by agents other than colchicine and upon the illumination to which the treated seedlings are exposed. Evidence so far obtained supports the theory of multiple gene mutation, rather than the hypothesis that the new chracteristics are the result of concentration of chromatin from the progenitors. Attempts to demonstrate somatic reduction, postulated as being responsible for the true-breeding behaviour, have been inconclusive. In breeding, diploid mutants have provided valuable variability and a means of immediately producing true-breeding lines from heterozygous material [cf. XIX, 1088].

1226 *Frey, K. J. Adaptation in small grains.* (*p. 58*).

Wide adaptation in a cultivar may be due to (1) genetic diversity and (2) "a built-in mechanism of reaction within a pure-line genotype." The latter type of adaptability may be due to capacity to react suitably to favourable environmental factors at several distinct stages of growth. In Iowa, the critical stages in oats for the three yield components, number of panicles per plant, number of seeds per panicle and seed weight, are respectively 0–2, 3–6 and 9–13 weeks after sowing. With the application of 40 lb. of N fertilizer per acre, Marion produced more panicles per plant and seeds per panicle, whereas Clintland yielded only more seeds per head and Bond was unaffected. If these varieties respond to other environmental factors in a similar manner, Marion should produce good yields over a wider series of environments than the other two varieties.

1227 *Grafius, J. E. The prediction of the relative yield of different oat varieties based on known environmental variables.* (*p. 59*).

"Five vector sets made up of 22 varieties of oats grown under five different environments were picked to represent the effects of high night temperature, low night temperatures, drought, lodging, and the composite effect of certain races of both stem and leaf rust. These vectors were made orthogonal and used to predict the yield of varieties for nine other environments. Vector analysis makes it possible to use long-time records of temperature, rainfall, lodging, and specific diseases to estimate varietal performance. Thus varietal recommendation could have a long-time average base but not be based on long-time varietal averages. This technique would help overcome one of the main difficulties in the release and recommendation of new varieties."

1228 *Hadley, H. H. The cytogenetics of* Sorghum. *(p. 59).*

The results of cytogenetical research on *Sorghum* by the author and other investigators are summed up.

1229 *Hanson, C. H. Recurrent selection in alfalfa. (p. 59).*

Two breeding procedures for improving disease and insect resistance were compared. Six cycles of recurrent phenotypic selection were practised in two populations and one cycle of recurrent reciprocal selection in four populations. To complete one cycle, the two procedures required one and four years respectively. Selection was made for several characters in each cycle so as to lessen the risk of severe selection pressure for any particular character. The results indicated that preceding recurrent reciprocal selection with several cycles of phenotypic selection may be advantageous. Recurrent phenotypic selection appears to be promising in the early stages of selection for characters having a relatively high heritability.

1230 *Hanson, W. D., Leffel, R. C. & Howell, R. W. Genetic relations between protein, oil and residual energy fractions of soybean seed. (p. 59).*

Data from 3500 F_3 genotypes were analysed in order to study the quantitative inheritance of the energy derived from the oil, protein and residual fractions and also the genetic control of the paths from the simple sugar units to the different fractions. The F_3 lines had been produced from 45 diallel crosses of 10 parents. Energy per acre, whether based on oil, protein or both, was at least as efficient a criterion for selection as yield. Genetic variability for yield accounted for about 89% of the genetic variability in energy of oil per acre, as compared with 95% for energy of protein and 98% for energy of oil and protein.

1231 *Jellum, M. D. & Bonnett, O. T. Histological studies of oat straw in relation to lodging. (pp. 59–60).*

A study was made of lodging in 10 varieties, by means of the chain test and histological investigation of the culm in the second internode from the ground. Use of benzidine for staining lignified tissues was highly satisfactory. It is concluded that "the overall structural morphology is more important than the histological structure in determining lodging reaction of any particular variety."

1232 *Johnson, E. C. & Osler, R. D. Combining ability between corn races from the Mexican tropics and others of diverse origins. (p. 60).*

Chosen as the most widely adapted tropical maizes in Mexico, the races Tuxpeño and Vandeño were crossed as testers with 31 Mexican and Central American races. Stiff-Stalk Synthetic from Iowa was also used as a tester in crosses with 21 of these races. In yield trials at Veracruz during 1958, Tuxpeño x Harinosa de 8 [Eight-rowed Floury] equalled the best recommended hybrid in the area. Other crosses giving high yields involved Zapalote Grande [Large Zapalote], Chapalote, Reventador [Pop] and Nal-Tel from Mexico and Tepecintle from Guatemala. Relatively similar rankings for combining ability were obtained with all three testers, with lowest yields from crosses with the unadapted Stiff-Stalk Synthetic.

1233 *Josephson, L. M. Gene-cytoplasm interactions in 33–16 type male-sterility in corn. (p. 60).*

Inbred Ind. 33–16 produces normal pollen but has a cytoplasm causing pollen sterility when combined with genes from certain other inbreds. This cytoplasm was transferred to inbred Ky27. It had the effect of complete sterility throughout 12 generations of back crossing. This source of sterile cytoplasm has in turn been transferred to several other inbreds and has remained stable. Test crosses involving both the Ind. 33–16 and Texas types of sterile cytoplasm showed that, of 17 inbreds with pollen-restoring ability with respect to the Texas type, only 9 possessed this ability as regards Ind. 33–16 cytoplasm. Six inbreds restored Ind. 33–16 cytoplasm but had no effect on the Texas type, restoration of fertility apparently being due to a major dominant gene for complete fertility plus at least one modifier for partial fertility. The modifier seemed to be influenced considerably by the environment. No other inbreds have been found to carry cytoplasm similar to that in Ind. 33–16.

1234 *Kannenberg, L. & Elliott, F. C. Ploidy in* Trifolium ambiguum *(Kura clover). (p. 60).*

Plants from 14 sources were studied with respect to chromosome number and the relationships of morphological and other characteristics with chromosome number (2*x*, 4*x*, 6*x*). Predominantly one chromosome number was found within a source, although variants were noted. In the greenhouse, the variants were similar morphologically to plants with the predominant chromosome number. In this environment, morphological characters were more strongly associated with source than chromosome number. Various explanations of the patterns of variation are considered.

1235 *Kincer, H. C. & Josephson, L. M. Response of prolific and single-ear corn hybrids to plant population.* (*pp. 60–61*).

Information is given on the performance of hybrids of the above two types when grown at rates of 8300, 12,400 and 16,600 plants per acre. Some differential responses between the two types are noted.

1236 *Kramer, N. W. Combining value in* Sorghum. (*p. 61*).

Data obtained at the Texas Agricultural Experiment Station have indicated differences in general combining ability for grain yield between ♀ lines and between pollinator lines. Significant deviations from the performance predicted for specific combinations on the basis of the average value of the parents have also been detected. Other aspects which have been considered are: segregation in the early generations of selection in combine kafir types for performance in hybrids; effects of season and locality on expression of combining ability in certain crossess and the probable effectiveness of different breeding techniques in relation to general and specific combining ability for yield.

1237 *Lambert, J. W. & Rasmusson, D. C. Tiller number in a six-rowed* x *two-rowed barley cross.* (*p. 61*).

Parents, F_1s, F_2s and both back crosses of Montcalm (six-rowed) x Rika (two-rowed) were grown in replicated space-planted plots at two centres in Minnesota. Environmental variance for tiller number exceeded genetic variance, resulting in a low estimate of heritability and corresponding lack of expected gain through selection. Apparently dependent on several genes acting additively, tiller number was independent of *Vv* for six rows *v.* two rows, with the exception of the F_2 at one centre, the association being nonparental in this instance.

1238 *Leffel, R. C. & Hanson, W. D. Predictive value of spaced F_1 and early-generation bulked progenies of diallel crosses among ten varieties of soybeans.* (*p. 61*).

Diallel crosses among 10 varieties were tested as spaced F_1 progenies at Beltsville, Md., in 1952, as F_2 bulked progenies in three localities in 1953 and 1954, and as F_3 bulked progenies in two localities in 1955 and 1956. The performance of a random sample of F_3 lines from each of the 45 crosses was regarded as being indicative of the true potential of the combinations. Random samples of 20 F_3 lines per cross were accordingly grown at two centres in 1955 and 1956. Early-generation testing of bulk progenies was of value in estimating the potential of crosses, as determined by means of the F_3 lines, in the case of yield and oil content but was of questionable value for protein content [cf. XXIX, 2057].

1239 *Mann, T. J., Matzinger, D. F. & Weybrew, J. A. The nicotine and sugar contents of Mammoth flue-cured tobacco varieties.* (*p. 61*).

Standard and Mammoth varieties had respectively 1·62% and 1·15% nicotine in their cured leaves but the two types showed no consistent differences in percentage of reducing sugars.

1240 *Marshall, H. G. & Myers, W. M. A cytogenetic study of certain interspecific* Avena *hybrids, and the inheritance of resistance in diploid and tetraploid varieties to races of crown and stem rust.* (*pp. 61–62*).

Inheritance of the resistance of six varieties of *A. strigosa* (2*n*) and one variety of *A. abyssinica* (4*n*) to races 203, 216 and 276 of *Puccinia coronata* var. *avenae* was studied in the F_2. Depending on the race, resistance was conditioned by (1) a single dominant or partially dominant gene, (2) two independent dominant genes, (3) a dominant gene and a recessive one or (4) a single recessive gene. *A. strigosa* (4*n*) x *A. sativa* hybrids were back crossed to the latter parent. Fourteen of 16 F_2BC_1 and BC_2 individuals carried *A. strigosa* resistance to crown rust. Cytological study of interspecific hybrids suggested that the two genomes of *A. abyssinica* are partly homologous with the genome from *A. strigosa*. Evidence concerning genomic relationships between *A. strigosa* and *A. sativa* and between *A. sativa* and *A. abyssinica* was less conclusive.

1241 *Matzinger, D. F. Genetic variability in flue-cured varieties of* Nicotiana tabacum. *II. Dixie Bright 244 x Coker 139.* (*p. 62*).

The high-yielding varieties Dixie Bright 244 and Coker 139 are unacceptable to the industry as they are unsatisfactory in certain chemical and quality characters. They differ, however, as to the characters for which they are unacceptable.

Estimates of genetic variability were obtained from the F_2 of a cross between the two varieties according to a model of additive gene action with dominance. Characters for which additive genetic variance was significant were yield per acre, number of days to flowering, plant height, number of leaves, number of suckers and percentages of total alkaloids and nornicotine. Characters showing dominance variance were value per 100 lb. and height. Estimates of genetic variance indicated the possibility of considerable gain through selection within the population [cf. XIX, 1050].

1242 *McLennan, H. A., Greenshields, J. E. R. & MacVicar, R. M. A genetic analysis of population shifts in pedigree populations of Lasalle red clover.* (*p. 62*).

Lasalle is constituted by blending the varieties Ottawa and Dollard in equal proportions for the foundation seed. Ottawa has 95% of plants with leaf marking and Dollard 5%. When Lasalle is grown in the Great Plains region in Canada, a highly significant shift towards the Dollard component occurs, as shown by observations on leaf marking, whereas when grown in eastern Canada the component varieties remain in equilibrium or a slight drift towards the Ottawa variety may be observed. Plants from seed lots from 36 growers were studied with respect to leaf marking and traced back to the original foundation seed.

1243 *Middleton, G. K., Reid, D. A., Hebert, T. T. & Davis, W. H. Protein content and other quality factors in certain varieties of winter barley.* (*p. 62*).

Protein content in 18 barleys grown at 14 centres in the southern USA during 1957–58 varied significantly, ranging from 9·31 to 10·68%. No correlation was found between yield and protein content at 13 centres. Caryopsis percentage and weight per bushel were positively correlated ($r = 0{\cdot}3922$). In general, fully-awned varieties produced grain with heavier weight per bushel than varieties not fully awned.

1244 *Moore, R. A., Shank, D. B. & Dirks, V. A. The effects of seedling-stage colchicine treatment on an inbred line of corn.* (*p. 62*).

Germinated seedlings of inbred SD7 and of a smut-resistant derivative of this line selected in 1955 after colchicine treatment were treated with this chemical. Individual within-row measurements for vegetative characters were recorded on progenies obtained by selfing plants from treated and control seeds. Variance analyses between and within the different progenies were made for each character. The possibilities of colchicine treatment in developing inbreds are discussed on the basis of the results.

1245 *Murphy, R. P., Risius, M. L. & Sayers, E. R. A study of the variation in seed setting among individual plants of Narragansett alfalfa.* (*pp. 62–63*).

Individual plants were selected for high and low seed set. Each selection was hand pollinated in the greenhouse by selfing, and crossing with a random assortment of high seed setters and of low seed setters. Selections with high seed set had high fertility in outcrosses and varied widely in self fertility. Low seed setters varied in fertility in out crosses and were in general low in self fertility; the low seed setters producing a considerable amount of seed in the greenhouse may be plants misclassified in the field or unattractive to bees. Many low seed setters were poor in pollen production. Variation in seed set was not associated with any morphological or physiological characteristic. Progenies of the selections were studied in the field in 1959; so far no aneuploids have been found.

1246 *Nath, J. & Nielsen, E. L. Cytological behaviors related to seed set in inbred and open-pollinated timothy.* (*p. 63*).

Highly self-fertile and cross-fertile plants were characterized by low frequencies of meiotic irregularities. Low seed set was associated with the following heritable abnormalities in meiosis: (1) thick-walled sporocytes and cenocytes, (2) prophase lethality as the result of failure of the chromosomes to develop normally, (3) precocious formation of persistent spindles, with centromere behaviour to some extent resembling that of the neocentromere in maize, and (4) a single B chromosome.

1247 *Nicknejad, M. & Elliott, F. C. The utilization of* Secale *germplasm in forage improvement.* (*p. 63*).

When *S. montanum* is used as ♀ in interspecific crosses, the hybrid seeds fail to germinate. The cross *S. cereale* ♀ x *S. montanum* gives seed with good germination, the hybrids being fairly fertile in intercrosses among F_1s or in back crosses to both species. Iranian and other introductions of *S. montanum* combine resistance to mildew and rust with leafiness and late flowering. Combination of desirable characters of both species in allotetraploids is an attractive objective in forage-crop improvement. Allotetraploids have been induced by colchicine. At meiosis they contain a maximum of 2_{IV}, indicative of the main translocation by which the $2x$ parents differ. Attempts to stabilize promising allotetraploids are under way. The effects of chemicals on recombination of parental characteristics have also received attention.

1248 *Nielsen, E. L. Meiotic and breeding behavior of a putative* Agroelymus *hybrid.* (*p. 63*).

The parentage of *Agroelymus turneri* ($2n = 28$), a highly sterile natural intergeneric hybrid discovered at Ft. Saskatchewan, Alba., appears to be *Elymus innovatus* ($2n = 28$) x *Agropyron dasystachyum* ($2n = 28$). Progenies from seeds produced at Madison, Wis., were however morphologically indistinguishable from *A. repens,* the chromosome number within clones varying from $2n = 11$ to 80. Three progenies from seed produced at Ft. Saskatchewan behaved differently. One consisted of plants resembling *A. repens* ($2n$ unstable). Another comprised plants ($2n = 28$) like *E. innovatus,* and the third an *Elymus*-like plant ($2n = 28$), a plant resembling *A. repens* ($2n$ unstable) and an *Agropyron*-like individual ($2n = 28$). Meiotic investigation of *Agroelymus turneri* revealed the occurrence of translocations, mitotic-like divisions and some nearly normal sporocytes. Early stages of meiosis in plants resembling *A. repens* were highly irregular, considerable lethality occurring before anaphase I. Seed set averaged 53% and pollen stainability 47% in 35 plants of this type.

1249 *Osler, R. D., Johnson, E. C. & Palacios, G. A comparison of six types of testers for evaluation of* S_1 *and derived* S_6 *lines.* (*pp. 63–64*).

Experiment I involved six pairs of lines* top crossed to four testers: an early variety and an S_1, S_3 and S_5 line derived from this variety. Each pair consisted of an S_1 line and an S_6 line derived from the S_1 line in question. Experiment II involved ten pairs of lines top crossed to six testers, five of the pairs also being used in I. The six testers were a later variety, an S_1, S_3 and S_6 line derived from this variety, a single cross of S_1 lines and a single cross of S_4 lines. One of the lines within each of the single crosses was extracted from the late tester variety. Both lines used in the single-cross tester involving S_4 lines were derived from the two S_1 lines in the first-mentioned single-cross tester. Analysis of yield data indicated that in neither I nor II were the interactions tester x line and tester x generation significant. In both I and II, "lines and testers were significantly different and the interactions generation x lines and generation x lines x testers were also significant. Generations were significantly different in the second experiment but not in the first."

1250 *Papa, K. E. & Williams, J. H. Selection for quantitative characters in the third generation following irradiation of soybean seeds with X-rays and thermal neutrons.* (*p. 64*).

The third generation of a population of Hawkeye and of another from Adams derived from irradiated seed was sampled to determine the effectiveness of selection for yield, time of maturity, seed size and oil and protein content. Observed and predicted gains were compared. Considerably more variation was found in the irradiated than in the control populations for most of the characters. In the irradiated populations, both early and late maturity and large and small seed size showed gains from selection. Gains from selection for high protein content were greater than for low content. Selection for high oil content resulted in little advance. Selection for yield was effective in irradiated and control populations of Hawkeye but ineffective in both populations of Adams.

1251 *Patterson, F. L., Schafer, J. F., Caldwell, R. M. & Compton, L. E. Breeding for straw strength in oats.* (*p. 64*).

Scotland (Club) and Milford have been used for improving straw strength in spring oats. Dense panicle and short stiff straw were completely associated throughout five back crosses of Scotland x Clintland to the latter. Dwarfing was monogenically inherited. A missing outer glume, lower floret sterility and shattering caused by breakage of brittle pedicels were associated with dwarfness. Heterozygous plants were intermediate in height and panicle type. Search for modified dwarf types with better fertility has met with limited success. Dwarfness appeared to be inherited independently of a fatuoid gene and of *L* for crown-rust resistance derived from Landhafer. Using Milford, promising results have been obtained in the attempt to combine improved straw strength with good agronomic type. The moderately dense panicle of this variety appeared to depend on a single major gene in limited back-cross families of several crosses. The relationship between panicle size, straw strength and height is being studied to determine the value of selecting moderately dense panicles as a criterion of short stiff straw.

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* Presumably maize.

1252 *Pedersen, M. W. Breeding for improved seed production in alfalfa.* (*p. 64*).

A synthetic (Utah Syn C) giving high seed yields has been developed over a 12-year period at the Utah Agricultural Experiment Station. The procedure used involved isolation of introductions with high seed yields, followed by screening in a spaced-planted nursery and progeny testing. Similar to Ranger in hay production and quality and in bacterial-wilt resistance, the synthetic has produced 75% more seed than this variety and shown more resistance to *Pyrenopeziza medicaginis* (*Pseudopeziza jonesii*) and *Peronospora trifoliorum*.

1253 *Pergament, E. Components of variation of mature height and yield in* Medicago sativa *L.* (*p. 64*).

A mathematical model was formulated to determine the contribution of each locus to the additive and nonadditive components of the genotypic variance in an autotetraploid population. Formulae were derived which permitted partitioning of total variation in yield and height. For height, the genetic contribution to variation in the F_1 and F_2 was predominantly additive. The estimate of nonadditive action was negative but not significantly different from zero. For yield (dry weight), the genetic contribution to variation in the F_1 and F_2 was primarily nonadditive, the estimate of additive action being negligible. Estimates of genotypic variance in height and yield based on the model were in good agreement with those based on regression and F_2 variances.

1254 *Quinby, J. R. & Stephens, J. C. A review of sorghum genetics.* (*p. 65*).

In this brief survey, the emphasis is laid on the genetics of characters having economic significance.

1255 *Ramey, H. H., Miller, P. A. & Robinson, H. F. Estimates of the average degree of dominance of genes controlling quantitative characters in cotton.* (*p. 65*).

Over 100 F_2 plants from each of two populations were back crossed with both of the respective parent lines, to produce paired back-cross progenies. In replicated tests of the progenies in two environments, estimates of additive genetic and dominance variances were obtained for several characters. Additive variance of considerable magnitude was found for each character, indicating that the mass or pedigree methods would be effective in improving the population means. Only for yield in one population was the dominance variance high relative to the additive. In this case the exploitation of heterosis may be useful in improving yield. Estimates of genotype-environment interactions indicated that the material should be evaluated in more than one environment.

1256 *Rossman, E. C., Brown, C. E. & Carter, G. E. Mechnical planting of corn yield trials and breeding nurseries.* (*p. 65*).

Information is given on the use of cone-type seeders.

1257 *Rubis, D. D. & Draper, A. D. Plot technique in safflower yield tests conducted under irrigation.* (*p. 65*).

A report is given of investigations on plot technique for regular yield trials and for early-generation tests of progenies of individual plants at the Arizona Agricultural Experiment Station.

1258 *Schaaf, H. M. Selecting green needlegrass for low-dormancy seed.* (*pp. 65–66*).

Study of three successive generations in *Stipa viridula* showed low dormancy to be heritable. In 18-day germination tests in the greenhouse, emergence of selections for low dormancy averaged 70% as against 35% in unselected material. Dormancy is influenced by the environment as well as by genotype, and probably also by the interaction genotype x environment and stage of seed maturity at harvest.

1259 *Schmidt, J. W. & Weibel, D. E. The inheritance of a dominant character in wheat simulating* Triticum sphaerococcum. (*p. 66*).

Four out of 17 plants from (Comanche-Mediterranean-Hope) x Pawnee resembled *T. sphaerococcum*. They had blunt, wide flag leaves, awns reduced in length, extremely short, rounded glumes and "shot wheat" grain. The mutant type was inherited as a simple dominant, the dominant homozygotes being sterile dwarfs. The heterozygotes showed decreases in plant height, test weight, yield and kernel weight but increase in protein percentage of the grain. The dominant mutant was crossed with *T. sphaerococcum* var. *globosum*, the *sphaerococcum* effect being inherited as a recessive in the latter. The F_2 gave a satisfactory fit to a two-factor ratio, indicating that the gene for the dominant *sphaerococcum* mutant was not allelic to the *sphaerococcum* gene on chromosome XVI.

1260 *Schwer, J. F., Taylor, N. L. & Kendall, W. A. Use of osmotic pressure in evaluation and selection of small-seeded legumes.* (*p. 66*).

Seedlings from seeds of red clover, white clover and birdsfoot trefoil germinating most rapidly in solutions of mannitol with osmotic pressures of 11·5, 9·5 and 7·0 atmospheres, respectively, were selected. Control and selected plants were "intrapollinated" under isolated conditions. Seeds produced by the selected plants germinated under high osmotic pressure more rapidly than those from the controls. This may be evidence that plants possessing an inherent capacity for rapid germination under conditions of limited moisture could be selected. Tolerance of heat, cold and drought of progenies of the selections under controlled conditions in the greenhouse did not differ significantly from that of the controls. Disparities in rate of germination of seeds of different varieties of lucerne, white clover and birdsfoot trefoil suggested that reaction to osmotic pressure may be related to vigour.

1261 *Sears, E. R. Inducing the transfer of hairy neck from rye to wheat.* (*p. 66*).

In order to increase the frequency with which the character of hairy neck is transferred from rye to wheat, monosomics of the wheat Chinese Spring with respect to the chromosome for hairy neck derived from the rye Imperial were X irradiated prior to meiosis and used as pollinators of normal Chinese Spring. Of the 421 plants obtained, 30 were hairy necked, including two in which most of the long arm of the rye chromosome had been translocated to a wheat chromosome. In one hairy-necked individual, the rye chromosome had been converted to a small isochromosome, presumably through terminal loss of most of the long arm, followed by misdivision. The gene for hairy neck must therefore lie near the centromere of the rye chromosome, and translocations (except rare intercalaries) involving the gene must include almost the entire arm. Material carrying the small isochromosome was irradiated. Of 1530 offspring, 242 (15·8%) were hairy necked and 51 (3·3%) possibly contained translocations. At least 20 of the 51, however, had sectors without hairy neck. This suggested that many plants did not carry translocations but, instead, unstable telocentrics derived from the isochromosome.

1262 *Starling, J. L. Cytogenetic studies of the F_1 hybrid and hybrid derivative of two* Phalaris *species.* (*p. 66*).

Hybrids ($2n = 28$) of *Ph. arundinacea* x *Ph. tuberosa* var. *stenoptera* were morphologically intermediate between their parents. Under field conditions, they produced some viable pollen and were appreciably more winter hardy than *Ph. tuberosa* but less so than *Ph. arundinacea*. The average configuration at diacinesis was $I_{IV} + 11_{II} + 2_{I}$. Stickiness and non-disjunction were occasionally observed. All the hybrids were characterized by precocious movement of the chromosomes to the poles at metaphase I. Two inversions and other structural modifications were identified. About 7% of the pollen from the hybrids was functional as judged by stainability. Back crosses to *Ph. tuberosa* and open pollination revealed a similar degree of fertility for the ♀ gametes. In amphiploids ($2n = 56$) induced by colchicine treatment of F_1 hybrids, bivalents predominated at diacinesis. Precocious disjunction at metaphase and bridges and fragments at anaphase were also observed.

1263 *Stephens, J. C. & Lahr, K. A. Single-cross vs. 3-way sorghum hybrids.* (*p. 67*).

Use of hybrid male-steriles, instead of line steriles, for seed rows in crossing fields should be of commercial interest, if seed production can be thus increased without lowering yield or increasing variability in the farmers' fields. Seed for line and reciprocal hybrid male-steriles was obtained by hand pollination. In 1957, the hybrids set more seed than the line steriles in 130 of 135 comparisons of a hybrid adjacent to one of its parental lines on one side and a restorer on the other. The average increase was 63%. Corresponding figures for 1958 were 63 out of 66 and 78%. Single and three-way crosses were compared in yield tests at two centres in 1958. The three-way hybrids were in some cases more variable in height and flowering than comparable single crosses but in general showed no disadvantage as regards yields.

1264 *Stokes, I. E. & Coleman, O. H. Breeding sweet sorghum for resistance to diseases and lodging and for high yields of stalks and sugar.* (*p. 67*).

Ll for reaction to leaf anthracnose (*Colletotrichum graminicola*) is independent of *Pp* for plant colour and linked in the coupling phase with

Lsls for reaction to red rot (*Physalospora tucumanensis*). Reaction to rust (*Puccinia purpurea*) is controlled by *Pupu* and is independent of *Pp*, "seedcoat type" (*Ss*) and colour of seed "subcoat" (*Vv*). Reaction to zonate leaf spot (*Gloeocercospora sorghi*) is determined by *Glgl* and independent of *Pp*, *Vv* and *Pupu*. Lodging also depends on a single pair of genes, *Ee*, independent of *Ll* amd *Lsls*. The sorgos Sart, Tracy, Wiley and Brawley have been developed as the result of the programme of breeding and screening a large number of introductions for economic characters, initiated in the USA in 1941.

1265 *Stroman, G. N. Norms of acceptance in the breeding of Tanguis cotton. (p. 67).*

In evaluating selections, each character may be assigned a zero norm for commercial acceptability with simple plus and minus numbers away from this norm. Information is given on the application of a set of such norms for over ten characters of yield and quality in evaluating individual-plant selections of Tangüis.

1266 *Taylor, N. L., Harlin, W. C., Gray, E. & Kendall, W. A. An interspecific hybrid involving red clover. (pp. 67–68).*

Hybridization of *Trifolium pratense* with 38 other species of the genus was attempted at the Kentucky Agricultural Experiment Station. Sterile hybrids were obtained from *T. pratense* x *T. diffusum*. Amphidiploids of this combination were fertile and intermediate between the parents in several characteristics.

1267 *Thomas, W. I. Grissom, D. B. Cycle evaluation of recurrent selection for popping volume, grain yield, resistance to root lodging and ear damage in popcorn. (p. 68).*

Selection of lines from the original population and from the first cycle of reciprocal recurrent selection was based on a weighting system in which yield and popping volume were given twice the weight of lodging resistance and earworm damage. According to the frequency distribution of the second and third cycles, sufficient variability was present for further progress, especially in popping volume and yield. Individuals selected from the original population which were continued by selfing averaged, however, quite as well as the recurrent-selection population. Percentages exceeding the mean of the two control hybrids in the original population, first cycle and second cycle, were respectively: popping volume, 51, 77 and 90%; yield, 38, 38 and 90%; and root-lodging resistance, 82, 69 and 100%.

1268 *Voigt, R. L. Effectiveness of selection methods for yield in soybean crosses. (p. 68).*

Selections obtained by the method (1) of an early-generation (F_4) yield test were evaluated in comparison with those produced by standard (2) bulk and (3) pedigree methods. The material tested consisted of the F_5 of five crosses. Seed from each F_2 single plant per cross was divided so that the three methods were applied on the same genetic base. Compared with methods (2) and (3), which had not previously involved yield testing of lines, (1) resulted in a greater number of lines significantly above the mean yields of the crosses and fewer below, a greater number of lines exceeding the mean yield of the control Hawkeye, and lines with shorter height and less lodging. Compared with (2), (3) led to the production of lines more suitable in time of maturity, height and lodging. The two groups of lines developed by (2) and (3) were however about equal in yield. Yield showed no significant interaction for method of selection x cross. Superior high-yielding lines with suitable time of maturity, height and lodging resistance were secured; further evaluation may show one or more worthy of commercial release.

1269 *Webster, O. J. Problems relating to the development of sorghum hybrids. (p. 68).*

Improvements in stalk strength, resistance to head smut and carotenoid content are required. Development of hybrids with open panicles, nonweathering grain and midge resistance is a problem in some regions. The period of stigma receptivity of cytoplasmic-sterile lines is variable and should be determined before the lines are released.

1270 *Wells, H. D., Forbes, I. (Jun.), Edwardson, J. R. & Ostazeski, S. A. The inheritance of resistance to gray leaf spot in blue lupine. (p. 68).*

A mutant of pink-flowered bitter lupin, resistant to gray leaf spot (*Stemphylium solani*), was crossed with two susceptible, white-flowered, sweet lines. Susceptibility *v.* resistance was controlled by a single gene pair (*Glgl*), independent of a pair of recessive genes with a pleiotropic effect in preventing anthocyanin production throughout the plant. One of the susceptible parents was heterozygous for resistance to anthracnose; some F_2 segregates with white flowers and resistance to both diseases were therefore obtained.

1271 *Yu, P. & Robinson, H. F. Random inbred lines of corn and their performance in hybrids at different levels of inbreeding.* (*p. 69*).

A group of inbreds derived from an open-pollinated variety and accurately representing the gene frequencies of the parent populations provides valuable material for quantitative genetic analysis. An attempt has been made to develop a group of such homozygous lines from Jarvis and Indian Chief. The "randomness" of the group of lines within each population was evaluated for three degrees of inbreeding, by means of top crosses and interline crosses. The performance of hybrids between lines in the S_0, S_3 and S_5 indicated that unintentional selection had not been appreciable for yield but that detectable changes may have occurred in other characters. Visual rating of lines showed that such information was of little value in assessing their yield potential in top crosses with an unrelated tester. The bearing of these results upon early *v.* late testing of inbreds was considered.

1272 *Brown, D. M. & Chapman, L. J. Relationship between soybean development and environmental conditions.* (*pp. 69–70*).

Records of days from sowing to flowering in controlled climate chambers at Purdue University were used to derive a relationship between rate of development and temperature. Field studies in Ontario and Iowa corroborated the relationship, which was used as the basis for a heat index to classify varieties for time of maturity and to define their regions of adaptation. The reciprocal of the number of night hours to flowering was used as the measure of rate of development. The development-temperature relationship was curvilinear and parabolic. The units of rate of development were about 0 at 50°, 16 at 60°, 27 at 70°, 32 at 80° and 32·5 at 90° F. Adjustments to these units were necessary in the period of flowering and pod initiation when moisture became a limiting factor.

1273 *Laude, H. M., Stanford, E. H. & Law, A. G. Growth, flowering and seed production in clones of Ladino clover at two latitudes.* (*p. 72*).

The 21 clones used in the synthesis of Pilgrim were grown at Davis, Calif., and Prosser, Wash. Flowering was more uniform and persistent at Prosser while vegetative growth was greater at Davis. The best clones in these respects were however not necessarily the same in each locality. The greater variation in seed production at Davis suggests that genetic "shift," based on disproportionate seed production of the components of the variety, is more pronounced with increasing difference between the regions of parent-clone selection and of seed production.

1274 *Schaeffer, G. W., Haskins, F. A. & Gorz, H. J. Coumarin content of sweetclover: variation with genotype, growth stage, and portion of plant.* (*p. 74*).

An analysis was made of first-year plants of isogenic lines of known genotype with respect to *Cucu* and *Bb* for amount and form of coumarin. Contents of both free and bound coumarin were influenced by the plant part sampled and growth stage. Roots, stems and leaves of *cucubb* and *cucuBB* plants were low in both forms throughout the season. *CuCuBB* plants contained both forms and *CuCubb* plants contained bound coumarin but little if any free coumarin.

1275 *Sowell, W. F. & Ohlrogge, A. J. Comparative growth behavior of compact and Hy normal corn types under a high population stress.* (*p. 74*).

With high densities of planting, the semidwarf, compact type produced a higher yield of grain than the Hy normal type. The inbreds of the two types had roughly comparable genotypes, except for loci conditioning plant size. The growth rates of the two types at a density of 52,000 plants per acre were similar prior to flowering. Rate of vegetative growth in Hy normal was greater during flowering than at any other stage, whereas the compact type ceased to grow vegetatively at this stage. The high percentage of barren Hy normal plants indicated that this type cannot support rapid vegetative growth and ear-shoot initiation simultaneously at high rates of planting. Utilization of the sugars in the compact type at flowering for ear-shoot development is suggested as the cause of the superior yield of this type. Chromatographic tests and bioassays of tassel extracts showed that the compact type produced a lower amount of growth-promoting substances or more inhibitors than Hy normal.

1276 *Williams, N. E. & Harpstead, D. D. Respiration rate as a measure of performance in adaptation studies in oats.* (*p. 75*).

In a study of eight varieties at Brookings, S. Dak., respiratory activity was significantly correlated within varieties with a five-year average for yield and seed weight. A physiological approach to problems of varietal adaptation in the Great Plains therefore appears justified.

1277 *Collister, E. H. Renner's combine No. 15, a new variety of sesame adapted to complete mechanization.* (*p. 79*).

Developed at the Texas Research Foundation, Renner's Combine 15 is a "pure-line selection which possesses the highly desirable papershell pod characteristic, utilizing the mutant 'closed-pod' indehiscent germplasm received from Nebraska in 1947." It is best adapted to the east, west and north-central parts of Texas.

1278 *Hoyle, B. J. & Baker, G. A. The analysis of field trials based on the concept of islands of variation.* (*p. 82*).

A means of evaluating the analysis of variance as an interpretative tool was developed on the basis of data on the performance of nine barley varieties, studied in 276 replications in 28 experiments and subjected to many cultural practices. "The ranking of the grand, numerical, weighted means, used as one standard of comparison, showed rankings of non-significant plot means just as apt to compare favorably with the grand means as the rankings from highly significant plots. Concepts of blocks as employed in the analysis of variance were found to be unacceptable for good plot interpretation. By substituting a concept called 'islands of variation' which accounts for observable plot phenomenon, an interpretation called the SD technique is suggested which provides a much more realistic interpretation. For comparison: by analysis of variance, 50% of the experiments contain 'different' treatments. By SD analysis, 100% of the experiments contain 'different' treatments. By analysis of variance, about 9% of the individual means are 'different'. By SD analysis about 72% of the individual treatments are 'different'."

Proceedings of the Eighteenth Annual Meeting of the Soil and Crop Science Society of Florida, Gainsville, December 1, 2, and 3, 1958.

1958 : **18** : Pp. 383.

1279 *Deszyck, E. J., Koo, R. C. J. & Ting, S. V. Effect of potash on yield and quality of Hamlin and Valencia oranges.* (*pp. 129–35*).

The effect of different concentrations of potash on fruit quality, yield, growth and mineral content was investigated in the varieties Hamlin and Valencia. Varietal differences were found to be considerable.

1280 *Wilson, F. D. & Pate, J. B. Improvement of Sansevieria as a fiber crop through interspecific hybridization.* (*pp. 279–83*).
Fishler, D. W. & Pate, J. B. Sansevieria, a potential fiber crop. (*pp. 284–87*).

Of 38 plants from the cross *S. trifasciata* x *S. deserti*, 29 were diploid ($2n = 40$) and 9 were triploid ($2n = 60$). Hybrid and polyploid vigour was considerable.

The high fertility of the diploid hybrids has allowed the production of F_2 and back-cross populations. Twenty of the 108 clones of the (*S. trifasciata* x *S. deserti*) x *S. trifasciata* cross show promise.

1281 *Seale, C. C. & Allison, R. V. Fiber crop symposium—the production and processing of soft or bast fiber.* (*pp. 300–05*).

Comparisons were made of the fineness of fibres from 60 varieties of *Boehmeria nivea* as tested in German, Swiss and Japanese laboratories. The results of these tests on a sample of these varieties are given.

A number of varieties were tested for fineness of fibre at the Everglades Experiment Station, Florida, using the Pearson method. A Japanese variety designated Tatsutyama was found to possess the finest fibres. Fibre fineness of 25 varieties was determined by both the Pearson and micronaire methods, and a high degree of correlation was found.

Results are given for seven varieties tested for tensile strength, knot strength, abrasion resistance and flexual endurance (strength, shear, wear and flex).

1282 *Wilson, F. D. & Pate, J. B. Improvement of kenaf through breeding and selection.* (*pp. 320–22*).
Summers, T. E. Important diseases affecting kenaf in Florida. (*pp. 323–26*).

A review is given of progress in the development of varieties of *Hibiscus cannabinus* resistant to *Colletotrichum hibisci*, and resistant to or tolerant of root-knot nematodes. Crossing the nematode-resistant, ornamental *H. eetveldianus* with *H. cannabinus* produced sterile hybrids. Treatment of hybrids with colchicine was found to restore fertility and some success has been achieved in obtaining back-cross populations.

High-yielding, *Colletotrichum*-resistant strains have been selected from the variety Salvador.

1283 *Chang, H. S. Jute improvement in Taiwan.* (*pp. 327–33*).

From selections made between 1948 and 1950, four varieties were recommended by the Taiwan Agricultural Research Institute. These are: Huwei Green Bark 7, Hsinfeng Green

Bark, Taichung Special 1 and Shuishang Green Bark.

Since 1952 mass selection of 11,037 individual plants collected from all the major jute-growing areas has resulted in the development of nine new strains. The best of these, Y–6–466, and three other promising strains are now under trial.

Hybridization programmes designed to confer disease resistance on the variety Halmaheira 5 are in progress.

1284 Shelby, T. O.
1958 performance trials of field crop varieties.
Bull. Tenn. agric. Exp. Sta. 1959 : No. 293 : Pp. 47.

A tabular summary is provided of the results of trials conducted in 1958 and previous years in Tennessee.

1285 La estación experimental agropecuaria de Pergamino. (**The Pergamino agricultural experimental station**).
Circ. Divulg. Estac. exp. agropec. Pergamino 1959 : No. 2 : Pp. 29. (Mimeographed).

An outline of the history of the above station, founded in 1912, is presented, together with a brief account of its work and some of the varieties of cereals, grasses, legumes and flax which have been developed there. A new cytogenetics laboratory has recently been established.

1286 Rojas M., E.
Labor realizada por el programa de forrajes en la Costa (campaña 1957–58). [**Work carried out in the forage crops programme in the Costa (season 1957–58)**].
Bol. trimestr. Exp. agropec., Progr. Coop. Exp. Agropec., Lima 1959 : **8** : No. 2 : 16–18.

Oats. Tall, leafy forage varieties with good tillering capacity and resistance to stem rust and yellow rust have been selected from the world oat collection.

Sorghum. F_7 selections of Atlas x Short Kaura and the F_3 of Ellis x Sugar Drip are under study; the aim of the latter cross is the development of material resistant to rust and leaf spot. Among selfed material of Sudan grass, selected for rust resistance and winter hardiness in Lima, lines from Greenleaf are distinguished for their earliness and sweet, tender stems.

Sunflower. The production of green matter in spring in the Lima area is being studied in F_4 and F_5 selections of Klein x (Sunrise x 953–102–1–1–22) and La Estanzuela x (S–37–388 x 953–102–1–1–22).

1287 van As, J. B.
L.V.V. in 1957. (**The Department of Agriculture, Stock and Fisheries in 1957**).
Surinaam. Landb. 1957 : **6** : 107–81 + 32 tables.

The following work is mentioned in this report on agriculture in Surinam.

A new rice variety, Krakti, has been developed and is undergoing testing. The development of material from crosses of VD lines x Géant [Giant] continued and new crosses between smooth and rough leaved varieties have been effected.

Among cacao clones undergoing trial, ICS95 and ICS40 have so far yielded most fruits.

Seedlings from clones of *Coffea robusta* are under study, also cuttings from selected material of *C. robusta*, *C. conuga*, *C. uganda* x *C. congensis* and *C. excelsa*.

1288 Shendge, P. Y. & Chavan, V. M.
A review of genetic studies of food and oilseed crops of the Bombay State.
Poona agric. Coll. Mag. 1959 : **50** : No. 1 : 38–53.

A review is given of genetical investigations undertaken in Bombay State during the last fifty years dealing with the following crops: rice, wheat, maize, sorghum, *Pennisetum typhoides*, *Eleusine coracana*, *Panicum miliaceum*, *Setaria italica*, *Cicer arietinum*, *Cajanus cajan*, *Phaseolus aureus*, *Dolichos lablab*, groundnut, *Carthamus tinctorius*, sesame, castor oil plant, *Guizotia abyssinica* and linseed.

1289 Alston, R. E.
Physiology and the inheritance of anthocyanin pattern.
Genetica 1959 : **30** : 261–77.

The author reviews and interprets some of the more recent genetic and physiological studies reported on various plants, including crops, with a view to integrating the two approaches and thus facilitating the orientation of future research.

1290 Grinvald, C.
Heterozisul și importanța lui pentru practica agricolă. (**Heterosis and its importance in agricultural practice**).
An. Romîno-Soviet. : Ser. Agric.-Zooteh. 1958 : **12** : No. 2 : 45–47.

Theories on the nature of heterosis, Mendelian and Soviet, are reviewed, and instances of its exploitation in such crops as maize, forage crops, cotton, hemp, sugar beet, tobacco and vegetables are quoted.

1291 Ţiţin [Cicin], N. V.
Unele probleme ale teoriei şi practicii hibridării îndepărtate a plantelor. (**Some problems on the theory and practice of distant hybridization of plants**).
An. Romîno-Soviet. : Ser. Agric.-Zooteh. 1958 : **12** : No. 6 : 41–53.

[Cf. XXIX, 1309].

1292 Cicin, N. V.
(**The importance of wide crossing in applied botany**).
Bjull. glavnogo Bot. Sada (Bull. princ. Bot. Gdn.), Moskva-Leningrad 1959 : No. 34 : 3–10. [Russian].

Attention is called to the value of the wild species of fruit trees that occur on Soviet territory and the use that has been made of them as parents by Mičurin and other Soviet breeders, some of the varieties produced in this way being named; these include hybrids of apple x pear, apple x quince, domestic pear x *Pyrus ussuriensis*, almond x peach, red x black currant and red currant x gooseberry in addition to the many Mičurin varieties. Existing species have been resynthesized, for instance the domestic plum, and many new species created. By the use of suitable nutrient media it has been possible to raise mature plants from excised embryos of many cereal hybrids. Most of them give better sets of grain when pollinated with a distant species than with either of their parent species; thus the hybrid *Triticum vulgare* var. *lutescens* x *Agropyron glaucum* gave only 1·2% set with pollen of either parent but produced a large number of fertile hybrids when pollinated with *Secale cereale*. It is reported that *Elymus giganteus* and *E. arenarius* have now been crossed with wheat, barley and rye [cf. XXIX, 2419]. Some of the perennial *Triticum* x *Agropyron* hybrids give 3–4 cuts of hay, with a total yield of up to 100 c. hay per ha., per year, or, alternatively, a yield of grain plus 1–2 cuts of hay. Soft wheats with branched ears have also been produced.

1293 Torge, D.
Consfătuirea grupului operativ de lucru C.A.E.R. de la Varşovia în problema incercării soiurilor. (**The meeting of the working group of the Council of Mutual Economic Assistance at Warsaw concerned with problems of varietal investigations**).
Probl. Agric., Bucureşti 1958 : **10** : No. 2 : 65–67.

This meeting, held on 14–21 November 1957, was attended by representatives from Bulgaria, Czechoslovakia, eastern Germany, Poland, Rumania, Hungary and the USSR. The subjects discussed were the survey and registration of varieties, including land races, and field and laboratory methods for use in variety trials.

1294 Arnason, T. J. & Wakonig, R.
The mutagenic effects of 2 : 4 : 6 (ethyleneimino)-1 : 3 : 5 triazine (TEM) on plants.
Canad. J. Genet. Cyt. 1959 : **1** : No. 1 : 16–20.

Treatment of barley grains with various concentrations of TEM induced chlorophyll mutations in very low frequencies, the highest of which was 0·64 per 100 heads borne by plants raised from seed treated with a 5 x 10^{-4} M solution for 24 hr. Preliminary results suggested that TEM treatment before and after X irradiation had no effect or possibly a depressing effect on frequency of radiation-induced mutation. Many chromosome aberrations were observed in root-tip cells of *Vicia faba* as the result of TEM treatment for 12 hr. at a concentration of 10^{-5} M [cf. XXIX, 1125, 3486]. Extensive chromosome breakage also occurred during meiosis in barley, when cut stems bearing young ears were allowed to remain in a 10^{-4} or 10^{-5} M solution for 24–36 hr.

Atti del 5° Convegno Annuale Società Italiana di Genetica Agraria (Salice Terme - Pavia, 16–18 Giugno 1958). La poliploidia nel miglioramento delle piante coltivate (bieticoltura - praticoltura - frutticoltura). (**Proceedings of the Fifth Annual Meeting of the Italian Society of Agricultural Genetics, Salice Terme - Pavia 16–18 June 1958. Polypoloidy in the improvement of cultivated plants : beet, forage-crop and fruit cultivation**).
Genet. agr. 1959 : **11** : 1–224.

1295 *D'Amato, F. C-mitosis and experimental polyploidy in plants. (pp. 17–26); also in Italian. (pp. 3–16).*

In reviewing the subject along familiar lines, the author classified agents with action upon mitosis into inhibitors of (1) preprophase, (2) the spindle and (3) cytocinesis. C-mitosis may be the result of (*a*) nonspecific shock action and (*b*) specific chemical action, the cytological effects of colchicine and other agents being analysed. A list of typical c-mitotic chemical agents is given, together with comments on methods of using them in polyploidization.

Finally, techniques of inducing polyploids other than chemical treatment are briefly considered.

1296 *Rasmusson, J. Polyploids of sugar beets: use in the culture and the seed production.* (*pp. 46–64*); *also in Italian.* (*pp. 27–45*).
The author assesses the results of field trials of diploids, tetraploids, $2n$ and $4n$ bulk crosses, triploids and "polyploid" bulk crosses ($2n + 3n + 4n$) derived from mother-seed mixtures of diploids and tetraploids. Most of the field trials referred to were carried out in Sweden but results from Holland, Belgium, France and northern Italy are included. The following characters are considered: root and sugar yields per ha., contents of sugar, noxious N and K + Na, and bolting. Problems of the seed production of polyploid bulk crosses are discussed.

1297 *Donà dalle Rose, A. Valore teorico e pratico dei tipi di barbabietola migliorati sulla base della poliploidia indotta con riferimento ad un sessennio di coltura in Italia.* (*Theoretical and practical value of types of beet bred on the basis of induced polyploidy, with reference to six years of cultivation in Italy*). (*pp. 65–78*).
The immediate products of chromosome duplication in sugar beets in Italy were characterized by delayed germination, reduced seed production and increased susceptibility to disease; the triploids are however free from these defects. The commercial polyploid varieties show less variation in yield from year to year, particularly in southern Italy; their osmotic pressure is lower, their date of maturity is medium, they are relatively tolerant of *Cercospora* and free from bolting; their respiration rate is lower and they are consequently more resistant to drought; they are also easier to lift and more suitable for mechanized harvesting.

1298 *Marchesi, G. & Bianchi, A. La determinazione delle frequenze dei diversi gradi di ploidia nelle barbabietole 'poliploidi'.* (*The determination of the frequencies of the different grades of ploidy in "polyploid" beets*). (*pp. 79–83*).
Washed seeds were kept in a germinating chamber at 24° C. for about a week and the chromosomes were counted in acetocarmine smears from the root tips. Though many of the roots had no cells in which the chromosomes could be counted, the method is considered useful because of its rapidity.

1299 *Aldrovandi, A. Poliploidi normali o poliploidi resistenti.* (*Normal polyploids or resistant polyploids*). (*pp. 84–89*).
Though polyploid sugar beets resistant to *Cercospora* are now available in Italy, they still benefit from fungicidal treatment in respect of both root yield and sugar content; without such treatment their sugar yield is less than that of susceptible varieties that have been treated. It is therefore suggested that the efforts of plant breeders might be better employed in raising the yielding capacity of the polyploid strains, leaving the control of *Cercospora* to the chemist.

1300 *Scaramella, P. P. Caratteri strutturali e presenza di fibre in diverse varietà di bietole.* (*Structural characters and presence of fibre in various polyploid beet varieties*). (*pp. 90–96*).
The conformation of fibre layers in the petiole was found to be characteristic of the variety and to be indicative of the conformation in the root. Certain polyploid varieties such as Hilleshög, Cesena and Kleinwanzleben had a greater amount of fibre than the corresponding diploids and examination of the different individuals occurring within these varieties showed those with normal fibre development to be generally diploid, those with excessive fibre tetraploid and those with reduced fibre triploid.

1301 *Wit, F. Chromosome doubling and the improvement of grasses.* (*pp. 97–115*).
The author reviews results obtained with tetraploids of Italian, perennial and Westerwolths ryegrass at the Plant Breeding Institute, Wageningen, Netherlands. Although the initial tetraploids offered on the average no improvement over the diploids, selection for a few generations has resulted in tetraploids superior to diploids in various desirable characters. In tetraploid selection of all the agrotypes studied, more rapid initial development and earlier spring growth than in the corresponding diploids were attained. Tetraploids of Italian rygrass surpassed diploids in winter hardiness, forage yield and seed production, while in perennial ryegrass, cold resistance, forage yield and rust resistance could be raised to or above the diploid level in as little as one cycle of selection. Ryegrass tetraploids have so far been inferior to diploids in dry-matter percentage. According to preliminary observations, $4n$ hay types of perennial ryegrass are more resistant to lodging than $2n$ families and may therefore prove more tolerant of greater amounts of N fertilizer. As previously reported, selection of $4n$ Italian

ryegrass for fertility and forage yield resulted in families higher in seed production than the diploids [cf. XXVIII, 4289]. The result of only nine years' work, the first 4*n* strains of perennial, Italian and Westerwolths ryegrass have been submitted for registration and for inclusion in the Dutch List of Varieties of Field Crops. The value of allopolyploids between *Lolium* spp. and *Festuca pratensis* is also being explored. Triploids from 2*n* *Lolium* x 4*n* *F. pratensis* have produced a small amount of seed and been earlier in spring growth and more productive than their parents. Seeds from the triploids have been treated with colchicine. The expected hexaploids may be of value in themselves or useful as parents for the transference of desirable characters to *F. arundinacea.* The hexaploids may possibly be produced on a larger scale by crossing 4*n* *Lolium* with 8*n* *F. pratensis.* Octoploids of *L. perenne*, *L. multiflorum* and *F. pratensis* have been produced in order to test this possibility and to attempt to combine four genomes of *Lolium* with two of *F. pratensis.*

1302 *Hertzsch, W. Experiences with polyploid fodderlegumes.* (*pp. 116–21*).

The author reviews his work in Germany. Polyploids of *Vicia villosa* reverted to diploidy [cf. XXIII, 1780]. Polyploids of *Ornithopus sativus, Medicago lupulina, Trifolium pratense, T. hybridum* and *T. incarnatum* have been higher in forage yield than diploids in most cases but poor in fertility. Selection has however resulted in normal fertility after about eight generations in tetraploids of *O. sativus* and *T. hybridum* [cf. XXV, 2104, 2109]. This improvement is ascribed to gradual adaptation to the environment and to normalizing of initially disturbed meiosis.

1303 *Speckmann, G. J. Some technical aspects of the production of polyploids in fodder crops.* (*pp. 122–43*).

Mainly with reference to results obtained at the Plant Breeding Institute, Wageningen, Netherlands, details are given of techniques found most suitable for inducing polyploids of *Beta vulgaris*, turnip, grasses and clover by colchicine and for identifying polyploids of these crops by cytological and other characters.

1304 *Meletti, P. Sull'origine di un* Triticum *esaploide, il "Denti de Cani" spontaneo in Sardegna.* (*On the origin of a hexaploid* Triticum, *wild Denti de Cani in Sardinia*). (*pp. 144–48*).

Views previously expressed concerning the origin of this wheat by hybridization between *Triticum durum* and *Haynaldia villosa* [cf. XXVIII, 2746] are supported by the occurrence of 60 plants of Denti de Cani [Dog's Teeth], with $2n = 42$, in the progeny of two typical ears of *T. durum* in Sardinia. The tendency towards cross fertilization seems to be particularly high after late spring frosts.

1305 *Frandsen, K. J. Some aspects of the breeding of polyploid forage plants.* (*pp. 149–59*).

Information gained on the productivity of tetraploids of red and Alsike clovers and tetraploids and triploids of forage beet at the Plant Breeding Station, Øtoftegaard, Denmark, is assessed. Red-clover tetraploids surpassed diploids in persistence, yields of dry matter and crude protein per ha. and tryptophane content but were rather low in fertility. They were lower in dry-matter percentage but higher in crude protein. A tetraploid synthetic of the Alsike clover Øtofte II exceeded diploids in yields of dry matter and crude protein and was recommended, but because of its reduced seed set it has not come into commercial use. Intensive selection may be expected to result in improved seed set in both clovers since breeding material shows significant variability in fertility. Triploid forage beets have displayed superiority over diploids in dry-matter yield and will probably be available in the near future for commercial planting. It has been possible to combine comparatively high dry-matter percentage with high root weight in triploids.

1306 *Sjoseth* [*Sjøseth*], *H. Studies on winter hardiness in red clover* (Trifolium pratense) *and winter rye* (Secale cereale). (*pp. 160–72*).

Additional information is provided on the results of artificial freezing tests of diploids and tetraploids of red clover and rye at the Agricultural College of Norway, Vollebekk [cf. XXVIII, 1420]. The results of experiments on diploids and tetraploids of red clover with respect to (1) winter hardiness under field conditions and (2) the effects of ice covering in the laboratory and field are also reported. Artificial freezing tests showed the tetraploids of both crops to be significantly lower in frost resistance than the diploids. The tetraploids showed, however, differences in frost hardiness according to their origin, suggesting that hardy tetraploids may be secured if sufficiently frost-resistant diploid progenitors are used. Observations on (1) were in general agreement with the results of the freezing tests. In experiments on (2), differences between tetraploids and diploids were of less magnitude than those found in the freezing tests. Preliminary experiments on physiological characters possibly related to frost hardiness were initiated. Chemical analysis of red-clover roots and leaves revealed higher dry-matter and total-ash contents in hardy than in nonhardy varieties but no disparity in sugar content. Red-clover varieties differing markedly in hardiness were similar as regards osmotic potential.

1307 *Bingefors, S. Practical experience of tetraploid clovers in Sweden. (pp. 173–80).*

The performance of tetraploids of red and Alsike clovers with respect to green-matter yield, resistance to fungi and *Ditylenchus dipsaci*, persistence, chemical composition, fodder value and seed production is surveyed with reference to the literature.

1308 *Dionigi, A. Poliploidia e "resistenza al freddo". (Polyploidy and cold resistance). (pp. 181–86).*

The author reiterates his concept of active lethargy [cf. XVIII, 854], which is viewed as a normal state of the organism leading to cold resistance. A similar tendency towards an extension of the vegetative phase results from polyploidy, but this is regarded as an abnormal state and is not always associated with increased cold resistance.

1309 *Bianchi, A. & Marchesi, G. Tentativi di produzione di angurie poliploidi. (Attempts at producing polyploid water melons). (pp. 187–90).*

Further experiments are described [cf. 863] in which seedlings of the cultivars Charleston Gray, Congo, Fairfax, Bagnacavallo and Scorza nera mantovana [Mantua Black-skin] were treated with 0·03–0·4% colchicine solutions for varying periods. Most seeds from the 155 fruits obtained gave rise to diploid plants although some of the seeds were above the normal size; only one of the fruits contained a certain number of seeds thought to be triploid.

1310 *Celestre, M. R. Poliploidia indotta da campo elettrico continuo. (Polyploidy induced by a continuous electric field). (pp.* 191–95).

Root tips of *Allium cepa* and *Hyacinthus orientalis* subjected to an electric field equivalent to 1,000,000 V./m. for 8 hr. and 3 hr. respectively contained a number of polyploid cells.

1311 *Bianchi, A., Moja, A. M., Mariani, A. & Mainardi, L. Genetical and cytological studies on Italian varieties of maize.* (*pp.* 196–202).

This paper covers the same ground as an earlier report [XXIX, 938].

1312 Boo, L.
Effect of gibberellin on the growth in length of polyploids.
Svensk bot. Tidskr. 1959 : **53** : 283–86.

The stimulating effect of gibberellin on growth in length was less in tetraploids of the rye Steel, the vetch Skultuna, the Alsike clover Svea and the red clover Hersnap than in the corresponding diploids.

1313 KOMAZAWA, T.
(**Chemical studies on food stuffs obtained from agricultural crops grown in the Okayama region. III. General analysis. 3**).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. Exp. Sta. 1958 : No. 56 : 183–90. [Japanese].

Chemical analyses are reported of the products of numerous varieties of the following crops: soya bean (protein and fat); tomato, cucumber, egg plant, strawberry, pear, plum, peach, fig, grape and mandarin (acidity and sugars); and rice, wheat and barley (protein and starch).

1314 MAO, Y. T.
A preliminary list of crop plant collections and their custodians.
Pl. Introduct. Newslett. FAO 1959 : No. 6 : Pp. 124. (Mimeographed).

Arranged alphabetically according to crop, this list offers a record of the collections maintained by breeders and botanists in various countries.

1315 (**Utilizing fully the resources of breeding and seed production**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 1 : 3–7. [Russian].

The utilization of the wheats and other crop plants in the collection of the Institute of Plant Industry in breeding is recommended. The breeding methods should include polyploidy and the use of mutagenic agents such as ionizing radiation.

1316 Kupcov, A. I.
(Characteristics of artificial selection in plant introduction).
Trud. Bot. Inst. Komarov. Akad. Nauk SSSR (Trans. Komarov bot. Inst. Acad. Sci. USSR) : Ser. 6 1959 : No. 7 : 48–52. [Russian].

Different ways in which artificial selection can aid introduction of wild plant species in cultivation are discussed, the conclusions being based on research by various workers, including the writer's own work on introduction of guayule, *Taraxacum kok-saghyz* and *Scorzonera tau-saghyz* in the USSR.

1317 Jaarverslag 1958. Instituut voor Plantenziektenkundig Onderzoek. **(Annual report, 1958. Institute of Research in Plant Pathology), Wageningen:** Pp. 167.

Part of this report is concerned with testing for resistance to pests and diseases in numerous crops and includes the following results.

Wheat. A physiological race of yellow rust found in 1957 has proved more winter hardy than other races. The most prevalent races in the Netherlands are 7X and 55. An *Agropyron*-wheat hybrid tested showed seedling susceptibility to nearly all isolates, while seedling resistance to most isolates was shown by Felix and to all isolates by Riebesel 47/51. The last-mentioned variety is also field resistant to mildew and brown rust. Several varieties were seedling resistant to yellow rust race 53, isolated from Chinese 166. Resistance to the new smut race 8 was found in a number of varieties.

Barley. Resistance to mildew is now found only in barleys with *Hordeum spontaneum* in their pedigree, and is never combined with resistance to yellow rust.

Turnip. Differences in resistance to the physiological races of club root prevalent in Nijbroek and Harreveld respectively were found in some varieties but not others. A new race attacking both the Mommersteeg-Barenza group and two Belgian varieties has been found. A further race from east Flanders attacks all current Netherlands varieties, some new breeding lines, ten Norwegian varieties and all tested varieties of *Brassica napus*; of the material tested, only two horse radishes and a marrow-stem kale were resistant. It appears that altogether at least eight physiological races occur in the Netherlands and Belgium.

Flax. Netherlands varieties show satisfactory field resistance to most of the new rust races but only a few Russian varieties and one Australian flax were completely resistant.

Cucumber. The mildew-resistant American selections PI200815 and PI200818 have proved resistant also in the Netherlands and are being crossed with other cucumber and gherkin varieties.

Tomato. The resistant F_1 of a cross between a tomato susceptible to corky root and the resistant species *Lycopersicon glandulosum* was sterile in its first year but on being maintained over a second year produced several selfed fruits which yielded normally germinating seeds.

Phaseolus. More varieties were resistant to stipple streak virus in the summer than in the autumn. Seedlings of the dwarf French bean Cornell 49.242 and of *Phaseolus aborigineus* were resistant to all the physiological races of *Colletotrichum lindemuthianum* with which they were tested during the summer months but were attacked during the winter by some α and δ races.

Pea. Among primitive cultivated varieties and wild forms, only a few had combined resistance to the top yellows and enation viruses.

Abstracts of papers accepted for presentation at the fifty-first annual meeting of the American Phytopathological Society, University Park, Pennsylvania, August 31 and September 1–2, 1959.
Phytopathology 1959 : **49** : 533–56. (Absts.).

1318 *Atkins, J. G. & Lamey, A. Hoja blanca disease of rice. (p. 533).*

Among several thousand rice varieties tested in 1957 and 1958, several hundred were field resistant to the hoja blanca virus, transmitted by *Sogata oryzicola*, and many were resistant in artificial infection tests. The incorporation of resistance into USA varieties has begun.

1319 *Barnes, J. M. Extraction and bioassay of an antifungal substance from inbreds and hybrids of corn differing in susceptibility to* Gibberella zeae. (*p. 533*).

Extracts from resistant and susceptible forms contained similar amounts of a fungistatic, but not fungicidal, component when sampling was done at the silking stage. During the two months after silking, the substance gradually disappeared in both maize types, but more rapidly in the susceptible forms.

1320 *Berry S. Z. Pathogenicity and morphologic studies of Alternaria isolates from* Sesamum indicum. (*p. 534*).

Twenty-five isolates of *Alternaria,* causing a leaf and stem spotting disease in sesame in Maryland, South Carolina, Florida and Mississippi, differed in ability to sporulate on different artificial media and in spore size, culture characteristics and temperature optima. Tested on 11 sesame lines of varied resistance, the isolates were found to differ in virulence but showed no physiological specialization.

1321 *Brinkerhoff, L. A. Variability for pathogenicity of* Xanthomonas malvacearum. (*p. 534*).

Seven cottons from the Sudan, carrying the resistance genes B_1, B_2, B_3, B_4, B_5, B_2B_6 and B_2B_3, four American varieties with b_7, B_{In}, B_L, and B_N and one entirely susceptible control were used as differential varieties. Cultures of *X. malvacearum* from Oklahoma and elsewhere in the USA usually attacked lines with B_3 and B_5 and often B_{In} too. An occasional infected seedling of each of the differentials except B_2B_6 and B_2B_3 yielded isolates that consistently attacked the host from which it was obtained. All differentials except that carrying B_2B_6 were attacked by a culture from Uganda, those with B_2, B_3 and B_5 were attacked by a culture from the Sudan, those with B_{In}, B_L and b_7 by one from Nigeria, and those with B_2, B_3, B_4 and B_5 by one from Portuguese East Africa. An isolate genetically marked with resistance to streptomycin and penicillin produced one mutant that attacked the B_N line and another attacking b_7. Streptomycin resistance was retained after four host passages while penicillin resistance was lost.

1322 *Chakravarti, B. P. & Hart, H. Stem rust infectibility and tolerance to stem rust attack in wheat.* (*p. 534*).

In a two-year field study of inoculated wheats, in which rust infection was kept at zero, low, medium and high levels by appropriate spraying treatment, initial rust severity was usually 2–5% on Lee, Langdon and Sentry but 10–15% on the susceptible variety Carleton. Lee, Langdon and Sentry showed a slower increase of rust during the season than Carleton and tolerated 50–70% infection rather better.

1323 *Chattopadhyay, S. B. & Dickson, J. G. Induced mutation in* Helminthosporium oryzae *and the relation of nitrogen to disease development in rice.* (*p. 536*).

Ultraviolet irradiation of germinating conidia and young hyphal fragments of *H. oryzae* (*Cochliobolus miyabeanus*) induced albino mutants without any apparent change in conidial production or pathogenicity; both fine and coarse mycelial types were recovered.

1324 *Cook, A. A. Genetics of resistance to two virus diseases in* Capsicum annuum. (*pp. 536–37*).

Two strains of *C. annuum* were found to have in common one recessive factor for resistance to tobacco etch virus and another for resistance to potato virus Y. The two factors proved to be either one pleiotropic gene or two closely linked factors.

1325 *Covey, R. P. The effect of* 3 *isolates of* Fusarium graminearum *and herbicides on seedling blight of corn.* (*p. 537*).

Three *F. graminearum* (*Gibberella zeae*) isolates from Minnesota, Missouri and New York differed in the reduction in plant height and stand and the severity of root rot induced by them in the inbreds W10 and W22. The pathogens reacted differently to different temperatures.

1326 *Diachun, S. & Henson, L. Inheritance of necrotic, mottle, and resistant reaction to bean yellow mosaic virus in clones of red clover.* (*p. 537*).

After repeated inoculations of populations of the red clover Kenland, 85–90% of the plants finally became mottled, 3–6 showed local or systemic necrosis and 5–10% remained symptomless (resistant). Crosses involving clones showing the necrotic reaction and others with the mottling reaction indicated that the necrotic response was conditioned by a single dominant factor, *N*. Further crosses suggested that resistance is monogenically determined (*R*), dominant over mottling and epistatic to *N*. The genotypes of the clones studied appear to be: mottling clones KyC36 and KyC8–11, *nnrr*; necrotic clones KyC6 and KyC71–8, *Nnrr*; resistant clone KyC101, *NrRr*; and resistant clone Ky102, *nnRr*.

1327 *Dunleavy, J. Survey of races of* Peronospora manshurica *in the United States.* (*p. 537–38*).

Of twenty-three pathogenically distinct races of *P. manshurica* found on soya beans from 21 states, eight corresponded to the eight previously described races. The isolates could be characterized by their pathogenicity on 11 differential varieties. Mendota, Kanrich, Kanro and Midwest were resistant and Bansei and Grant susceptible to all isolates. Three introductions were immune from each of the nine isolates with which they were tested.

1328 *Edgington, L. V. & Dimond, A. E. Correlation between the wilt resistance of plants and the nature of their pectic substances.* (*p. 538*).

Pectins from tomato plants in which resistance to wilt pathogens secreting pectic enzymes had been increased by treatment with α-naphthaleneacetic acid were less readily hydrolysed by a pectic enzyme preparation than were those from plants whose resistance had been reduced by inducing Ca deficiency. Normal plants gave pectins of intermediate reaction.

1329 *Foley, D. C. Systemic infection of corn by* Fusarium moniliforme. (*p. 538*).

No consistent differences were evident between resistant and susceptible varieties in the frequency of isolation of *F. moniliforme* (*Gibberella fujikuroi*) from small pieces of tissue from unrotted stalks after surface sterilization.

1330 *Fulkerson, J. F. Occurrence and pathogenicity of white forms of* Corynebacterium insidiosum. (*p. 539*).

Isolates of *C. insidiosum* normally produce blue granules when cultured on suitable media, but occasionally give rise to a few white colonies. Stable forms of the latter were developed by selection and proved to be nonpathogenic on normally susceptible lucernes, although similar in colony type and cellular morphology to the wild type.

1331 *Hagedorn, D. J. Disease-resistant canning pea varieties, New Season and New Wales.* (*p. 540*).

[Cf. XXVIII, 3958].

1332 *Henson, L. & Diachun, S. Selection for resistance to a strain of bean yellow mosaic virus in Kenland red clover.* (*p. 541*).

Selection of symptomless plants from Kenland populations after inoculation with the bean yellow mosaic virus 204–1 was carried out over the period 1953–57. The selected material showed a lower incidence of infection than Kenland in greenhouse inoculation tests in 1958 and also displayed less mosaic and powdery mildew but more rust in a field test.

1333 *Hobbs, C. D., Futrell, M. C. & Toeppich, C. Vitamin B_6 content of isogenic lines of wheat resistant and susceptible to race 15B of stem rust.* (*p. 541*).

At the tillering and soft-dough stages of growth, the susceptible component of each of three pairs of isogenic hexaploid wheat lines, resistant and susceptible to stem rust 15B, contained more vitamin B_6 than the resistant component, the amount of B_6 being correlated with the extent of stem rust infection on the susceptible lines. At the jointing stage the resistant lines contained more B_6. It is noted that B_6 functions in the transaminase enzyme system, converting glutamic to aspartic and other amino-acids, and that an accumulation of glutamic and aspartic acids in plants has been shown to inhibit uredospore germination in rusts.

1334 *Hooker, A. L. & Russell, W. A. Inheritance of resistance to* Puccinia sorghi *in corn.* (*p. 541*).

The six genes Rp^1, Rp^2, Rp^3, Rp^4, Rp^5 and Rp^6, conferring resistance to *P. sorghi* [cf. XXIX, 2611], form an allelic series, with resistance dominant over susceptibility, and high resistance dominant over low.

1335 *Irvine, T. B. & Fulton, R. H. A study of laboratory methods to determine susceptibility of strawberry varieties to grey mold fruit rot,* Botrytis cinerea. (*p. 542*).

Susceptibility of seedlings and varieties was evaluated by (1) the effect of the presence of sterilized fruit juice in the culture medium upon fungal growth, (2) the effects of juice extracts upon spore germination and (3) measurement of fungal penetration into sound fruits. Juice from Empire and Sparkle inhibited growth and spore germination. Varietal differences in fungal penetration into the fruits were also found.

1336 *Kavanagh, T. A. A technique for seedling inoculation with chlamydospores of* Ustilago nuda *and* U. tritici. (*pp. 542–43*).

A rapid technique which has given up to 73% infection in barley and up to 31% in wheat and which shortens appreciably the period from inoculation to spore production involves: (1) removing the tips of the coleoptiles of the germinating seedlings when they are 1 cm. long; (2) immersing the seedlings in a suspension of 1 g. chlamydospores/l. distilled water + wetting agent, under a vacuum of 27 in. mercury; (3) suddenly releasing the vacuum after 2 minutes; and (4) planting the seedlings in autoclaved soil in a greenhouse at about 65° F.

1337 *McCain, A. H. The inheritance of pathogenicity in* Puccinia carthami. (*p. 544*).

In the F_1 of *P. carthami* race 1 x race 2 on the safflower variety W014 and of race 1 x race 3 on N977–15, high virulence was recessive to low, two complementary factors being involved in the first cross and one factor in the second. The genes governing infection type on W014 and N977–15 assorted at random, producing races 1, 2 and 3 and a new race, 5.

1338 *Murakishi, H. H. Varietal response to factors influencing the expression of tomato internal browning symptoms.* (*p. 546*).

Of four tomato varieties exposed to high and low light, with and without inoculation with tobacco mosaic virus, Indian River and Holmes' PI23567 showed no internal browning under any of the test conditions and Homestead and Fireball displayed more internal browning in the presence than in the absence of the virus. Homestead was more adversely affected by low light and Fireball by high light.

1339 *Murakishi, H. H., Honma, S. & Knutson, R. A seedling test for determining resistance in celery to* Cercospora *early blight.* (*p. 546*).

C. apii has been found to sporulate abundantly on Kilpatrick's carrot-leaf agar. The results of spraying seedlings at the 4 to 6-leaf stage with an aqueous suspension containing 5000–10,000 conidia per ml. and keeping the plants at 75–80° F. for 48–72 hr. were closely correlated with field-test results. Two lines resistant after repeated inoculations were found.

1340 *Nelson, R. R. Interspecific crosses as a means of studying evolution of sexuality and pathogenicity in the genus* Helminthosporium. (*p. 547*).

Interspecific crosses were effected between *H. maydis* (*Cochliobolus heterostrophus*) on the one hand and *H. oryzae* (*C. miyabeanus*), *H. sorghicola* and an unidentified *Helminthosporium* species pathogenic on rice on the other. Few perithecia were produced and, although each contained many asci, few ascospores developed and most failed to germinate. Some ascospore isolates studied proved cross fertile with one or other parent and others with neither, and some resembled one parent in pathogenicity while others attacked the hosts of both parents. The data suggest that related species have genes in common for sexuality and pathogenicity.

1341 *Schein, R. D. Resistance to* Rhynchosporium secalis *in the barley world collection.* (*pp. 549–50*).

Of 991 barleys successively screened for reaction to races US–1 and US–4 of *Rh. secalis*, 14 were finally selected for testing against the remaining five races, US–2, US–3, US–5, US–6 and US–7. The three lines CI3515 from Spain, CI8256 from Turkey and CI8286 (Gembloux-14) from France were immune from all races. CI7528 (Vima) was susceptible only to US–4, CI7283 only to US–6 and CI8251 only to US–1. All these lines were only partially winter hardy.

1342 *Schieber, E. & Dickson, J. G. Differential pathogenicity in the tropical corn rust pathogens.* (*p. 550*).

"Isolates of *Puccinia sorghi* and *P. polysora* from 4 general tropical areas have been tested on the 8 inbred lines of corn with alleles on chromosome 10 conditioning rust reaction. Their reaction on these differential hosts indicate a parallelism in specialized parasitism with the northern isolates of *P. sorghi*. Some of these tropical fungus lines have been inbred, and the recombinant lines evaluated parallel with the mother clones."

1343 *Semeniuk, G. Root rot resistance of corn inbreds and their F_1 hybrids in the field.* (*p. 550*).

In comparisons of seven inbreds and their 21 possible hybrids, the degree of rot was generally less in the hybrids than in either parent on 7 August or 27 August, but ranged between the parental scores on 27 September. There was evidence that some inbreds carried a preponderance of dominant genes for low rot scores and high number of roots, while others carried a majority of genes recessive for these characters.

1344 *Stokes, G. W. Interspecific transfer of wildfire resistance and varietal reaction.* (*p. 551*).

Resistance transferred from *Nicotiana longiflora* to *N. tabacum* is present in the varieties Burley 21 and Ky 61. Since $5–9_{II}$ occur in the hybrid *N. tabacum* ($n = 24$) x *N. longiflora* ($n = 10$), crossing over between homologous regions of the paired chromosomes would be possible and would allow the segment controlling wild-fire reaction to be transferred to a *N. tabacum* chromosome. If this were so, Burley 21 and Ky 61 would be expected to be similar in wildfire reaction. However, their F_1 progenies with susceptible plants differed, those from Burley 21 being more uniformly resistant than those from Ky 61, indicating that the gene for wild-fire resistance is more efficient in Burley 21. This could be due to a position difference in the *N. tabacum* genome.

1345 *Troutman, J. L. Development of resistance to streptomycin by* Pseudomonas tabaci. (*p. 553*).

Two isolates were selected for resistance by growing them in the presence of streptomycin, passing the resistant forms through tobacco to maintain pathogenicity and again subjecting them to streptomycin treatment, the process being repeated eight times. Loss of sensitivity was rapid during the first transfers and levelled off after the eighth.

1346 *Veenstra, M. A. & Huguelet, J. E. Dormant-plant symptoms for identification of the shoe-string virus in the Burlington and Jersey highbush blueberry varieties.* (*p. 553*).

Oval blotches and streaks 0·5–15 cm. long and varying in colour from light to brilliant red occurred on the one-year-old wood of dormant infected bushes of the varieties Burlington and Jersey. The symptoms were correlated with summer symptoms and were reliable within an error of 1%. Roguing could thus be much accelerated.

1347 *Wu, J. H., Hildebrandt, A. C. & Riker, A. J. Selection by tissue culture of a super mild strain of tobacco mosaic virus.* (*p. 555*).

Inoculation of a single-cell clonal tissue culture of *Nicotiana tabacum* (M222) with tobacco mosaic virus from field infected plants resulted in the selection of a supermild strain of the virus producing only minute lesions.

1348 *Zimmer, D. E. & Schafer, J. F. A spontaneous change for virulence in* Puccinia coronata. (*p. 556*).

A clone of race 202 of *P. coronata* previously producing only an 0 reaction, produced pustules on Ascencao PI186603 in the eighth and subsequent uredial generations following single-spore purification of the original clone. In tests on 26 oat varieties and selections, the culture derived from the pustules gave a Victoria-type reaction on Ascencao and otherwise differed slightly from the parental form only on Trispernia and Boadvic.* It is thought that either mutation or premature caryogamy is responsible for the changes in pathogenicity.

Holton, C. S., Fischer, G. W., Fulton, R. W., Hart, H. & McCallan, S. E. A. (Editors).
Plant pathology. Problems and progress 1908–1958.
Madison, 1959 : Pp. 588.

Major addresses on historical and developmental aspects of plant pathology.

1349 *Walker, J. C. Progress and problems in controlling plant diseases by host resistance.* (*pp. 32–41*).

This survey covers work effected during the past fifty years, studies on the variability of pathogens and on the inheritance of host resistance being mentioned. Reference is made to the author's work on resistance to cabbage yellows. It is shown that host resistance may be either a qualitative or a quantitative character and its expression is affected by the environment. The importance of polygenic resistance is stressed, this type of resistance being less likely to be broken down by new pathogenic races. It is thought that intensive study of the effect of environment on disease development is worth while because this may make it possible to decide whether a particular disease situation is the result of the appearance of a new pathogenic race or merely a break down of resistance under certain environmental conditions. Also it is pointed out that short cuts in resistance assay are needed and that very little is known about the basis of virulence, selective pathogenicity and host resistance. Mention is made of some investigations on the nature of host resistance; it seems that morphological barriers are rarely important. There is however evidence that phenolic materials play some part in host resistance. Success in using host resistance as a measure of disease control depends on continual basic research, accumulation of new host germ-plasm and continual use of resistant germ-plasm in a broad programme of crop improvement.

Symposium on genetic approach to elucidation of mechanisms governing pathogenicity and disease resistance.

1350 *Flor, H. H. Genetic controls of host-parasite interactions in rust disease.* (*pp. 137–44*).

The life cycle of *Melampsora lini* and methods of hybridizing and selfing this fungus are outlined. Studies on the inheritance of pathogenicity in *M. lini* and of the inheritance of rust reaction in flax are reviewed and the host-parasite relationship is considered with reference to the author's hypothesis that for each gene conditioning resistance in the host there is a corresponding gene conditioning pathogenicity in the fungus. Interactions between other rust fungi and various cereals are also discussed in relation to this hypothesis. The work mentioned has been already reported in *Plant Breeding Abstracts*.

1351 *Holton, C. S. Genetic controls of host-parasite interactions in smut diseases.* (*pp. 145–56*).

Studies on the genetical control of symptom expression, pathogenicity and host reaction in relation to smut diseases of cereals are reviewed. It is shown that both pathogenicity in the smut species and the differential reactions of host varieties may be determined by one or more genetical factors. Little progress has been made in relating individual genetic factors for pathogenicity to specific factors for resistance or susceptibility but this is thought to be a promising field for future research.

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1352 *Keitt, G. W., Boone, D. M. & Shay, J. R. Genetic and nutritional controls of host-parasite interactions in apple scab.* (*pp. 157–67*).

Most of the information provided in this account of studies of *Venturia inaequalis* has been summarized elsewhere in *Plant Breeding Abstracts.* The pathogenicity of the fungus is under the control of a series of gene pairs, each pair determining pathogenicity to a certain group of apple varieties. Inheritance of scab resistance to certain lines of the fungus is known to be controlled by single genes in some hosts and by polygenic systems in others. Induced mutants with biochemical deficiencies have been found to be nonpathogenic and their pathogenicity has been restored by supplying certain substances from outside the host; the critical substances include aminoacids, nitrogen bases and vitamins. Similar phenomena have been observed with mutants of other pathogens. It seems that although many of the required substances are present in the hosts, they are not so readily available at the infection sites of the scab fungus as at those of other pathogens. Experiments are now being carried out to find whether there are any susceptible hosts for biochemical mutants classified as nonpathogenic after tests with a limited number of apple varieties. The methionine mutant has caused lesions on leaves of certain seedlings and there is some evidence that biochemical mutants can act together in causing infection. Other experiments are now under way with a view to determining whether differences in pathogenicity of wild-type lines of *V. inaequalis* may be due to differences in their nutritional requirements.

1353 *Gallegly, M. E. & Niederhauser, J. S. Genetic controls of host-parasite interactions in the* Phytophthora *late blight disease.* (*pp. 168–82*).

The following topics are given a full review: the genetics of resistance to *Phytophthora infestans* in potato and tomato; physiological specialization in *Ph. infestans*; mechanisms of host resistance and the origin of physiological races. It is thought that more attention should be paid to increasing the degree of multigenic resistance in commercial varieties.

1354 *Buxton, E. W. Mechanisms of variation in* Fusarium oxysporum *in relation to host-parasite interactions.* (*pp. 183–91*).

Heterocaryosis, recombination by a parasexual mechanism and adaptation in response to changes in the environment are considered as three ways in which *F. oxysporum* f. *pisi* may produce variants with altered pathogenicity. Reference is made to the author's experiments on changing the pathogenicity of a race of the fungus by treatment with root exudate from a resistant host [cf. XXVIII, 4896]. The role of the three mechanisms mentioned in altering the pathogenicity of other organisms is also discussed.

1355 *Schwinghamer, E. A. Induced mutations of pathogens for the study of host-parasite interactions.* (*pp. 192–201*).

Mutagenic agents and methods of treatment which may be applicable to plant pathogens are considered and the literature on induced mutations used in studies of host-parasite relationships is reviewed.

1356 *Konzak, C. F. Induced mutations in host plants for the study of host-parasite interactions.* (*pp. 202–14*).

The possible role of induced disease-resistant mutations in studies of the biochemical and genetical interrelationships between crop plants and pathogens is discussed, considerations being given to the practical problems involved in obtaining such mutations; the relevant literature is reviewed. It is thought that resistant mutants will be useful not only in determining the nature of host resistance but also in breeding resistant varieties and in developing better differential hosts for the determination of different races of the pathogen.

1357 *Snyder, W. C. Epilogue to Part III.* (*pp. 215–18*).

A brief outline is presented of the available knowledge of host resistance, pathogen virulence and host-parasite interaction as described above.

1358 Zadoks, J. C.
On the formation of physiologic races in plant parasites.
Euphytica, Wageningen 1959 : **8** : 104–16.

In this survey the topics discussed include: the physiological specialization of the parasite; the gene-for-gene theory of the host-parasite reaction; variability in pathogens arising through mutation, hybridization and heterocaryosis; the origin and evolution of new races; and the main procedures used in breeding for resistance. The development of composite varieties composed of lines differing in their genes for resistance is regarded as the most suitable method for Europe.

1359 Person, C.
Gene-for-gene relationships in host: parasite systems.
Canad. J. Bot. 1959 : **37** : 1101–30.

Theoretical consideration of the origin of gene-for-gene relationships led to the conclusion that such relationships, postulated by Flor for the *Linum* : *Melampsora* system, should occur as a general rule in host : parasite systems. A model gene-for-gene system, with five related host and parasite loci, was designed to illustrate the properties inherent in gene-for-gene systems, and to illustrate a new method of analysing for these properties. Analyses of published data of the *Solanum* : *Phytophthora* and *Linum* : *Melampsora* systems proved that gene-for-gene relationships are in fact operative in these systems and that Flor's hypothesis is correct. Analysis of Flor's data showed, however, that most of his "single-gene" differential varieties actually possess two or more genes for resistance, and that resistance genes in these varieties need not fall into allelic or closely linked groups.

1360 Franklin, M. T. & Hooper, D. J.
Plants recorded as resistant to root-knot nematodes (*Meloidogyne* spp.).
Tech. Comm. Commonw. Bur. Helminth. 1959 : No. 31 : Pp. 33.

The list given in section I includes resistant varieties of crops.

Proceedings of the Tenth International Congress of Entomology, Montreal, August 17–25, 1956 (1958) : **1** : Pp. 941; **2** : Pp. 1055; **3** : Pp. 895; **4** : Pp. 1115.

1361 *Painter, R. H. The study of resistance to aphids in crop plants.* (**3**: *pp. 451–58*).

Mainly with reference to breeding for aphid resistance in the Kansas Agricultural Experiment Station during the past 30 years, methods of searching for sources of resistance under field or greenhouse conditions, the nature of resistance, inheritance of resistance, the effect of the environment on expression of resistance and the economic value of aphid-resistant varieties are discussed. The crops and aphids studied at this station are wheat and barley (*Toxoptera graminum*), maize and sorghum (*Rhapalosiphum maidis*), and lucerne (*Macrosiphum pisi*).

1362 *Guevara C., J. Variedades de frijol resistentes al picudo del ejote* Apion godmani *Wag.* (*Curculionidae*) *y a la mosca de las semillas* Hylemia cilicrura (*Rondani*) (*Anthomyiidae*) *en el Valle de México.* [*French bean varieties resistant to the weevil,* A. godmani *Wag.*, (*Curculionidae*), *and the seed corn maggot,* H. cilicrura (*Rondani*) (*Anthomyiidae*), *in the Valley of Mexico*]. (**3**: *pp. 461–62*).

Selections for resistance to *A. godmani* from among 400 varieties and many lines included some high-yielding varieties and others suitable only for use as parents. No evidence of the occurrence of escape from infection through differences in flowering time was found, and no relation between resistance and morphological characters, pH of the pods, flower colour or incidence of disease was detected. Crosses have been made between *Phaseolus multiflorus*, which is immune, and *Ph. vulgaris*, and also between varieties of the latter; F_4 and F_5 lines showing resistance are now undergoing trial. In preliminary tests for resistance to *H. cilicrura* in 12 varieties, a correlation between seed colour and resistance was found, the colours in descending order of resistance being black, pinto, yellow, white and tan. It is thought that the colour differences may be associated with differences in smell or taste.

1363 *Popov, V. B. Bees, their relations to melittophilous plants and the problem of alfalfa pollination.* (**4**: *pp. 983–90*).

The parallel and dependent evolution of insects and angiosperms is discussed. Investigations in central Asia by the author and other workers have shown that the honey bee plays an insignificant part in the pollination of lucerne. It is suggested that, in addition to detailed studies of pollinators, selection for reciprocal adaptation of the honey bee and lucerne should be attempted.

1364 *Pedersen, M. W. Nectar secretion in relation to seed production in alfalfa.* (**4**: *pp. 1019–24*).

Environmental and genetic factors affecting nectar secretion are discussed with reference to the literature and the author's investigations at the USDA Field Crops Research Branch, Logan, Utah. Small genetic disparities in sugar concentration have been detected between clones at Logan but are considered to be too limited to offer a useful basis for selection. Nectar production, however, offers more scope to the breeder. A three-fold range in production was found in one group of plants, the heritability value exceeding 60%. Crosses between parents low and high in nectar production provided evidence that this capacity is quantitatively inherited. Volume of nectar per plant rather than per individual flower proved to be the chief consideration in attractiveness to both bumble and honey bees.

CEREALS

1365 Gologan, I.
Cercetări ştiinţifice privind ameliorarea cerealelor în R. Cehoslovacă. (**Scientific investigations concerning cereal improvement in the Czechoslovakian Republic**).
Probl. Agric., Bucureşti 1958 : **10** : No. 3 : 59–61.

A brief account is given of cereal breeding projects in Czechoslovakia and of the organizations responsible.

International contact.
Sticht. Ned. Graan-Centrum, Wageningen : 1959 : No. 2 : Pp. 28. (Mimeographed).

1366 *Broekhuizen, S. Accomplishments in the Netherlands ten-years' project of cereal research. (pp. 5–18).*

Current breeding projects at the Netherlands Grain Centre are outlined and include: the development of barleys for light soils; studies of winter hardiness [cf. XXIX, 3630]; improvement of baking quality in wheat; and the development of rye for forage.

1367 *Dantuma, G. Report on the cereal breeding program of the Foundation for Agricultural Plant Breeding, Wageningen. (pp. 19–23).*

Some of the work described has been reported before [cf. XXIX, 2307]. In addition, it is noted that some American spring wheats with very good seedling and field resistance to yellow rust are being used as parents, and that some Ethiopian barleys are being used as sources of resistance to *Puccinia simplex*. In breeding oats, all crosses were carried out in a cool and humid greenhouse; up to 35% of the crosses were successful.

1368 *van Dobben, W. H. Report on the influence of soil-acidity on the development of cereals. (pp. 24–28).*

The resistance of a barley to soil acidity may be measured by its ability to compete with oats at a low pH [cf. XXIX, 2310]. Selection for resistance is readily effected on acid soils, since susceptible varieties may be distinguished by their poor growth immediately after emergence. A method of preparing a selection bed with a low pH is described.

1369 D'jakova, E. N.
(**For improvement of the work at the state varietal trials**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 1 : 66–68. [Russian].

Fuller descriptions and more extensive preliminary testing of the new varieties before they are submitted for state varietal trials are among the various improvements recommended. In recent trials in the province of Pskov, most of the new wheats have been found to be inferior to the standard variety Dan'kovskaja Granjatka, but this variety is said to be losing some of its valuable characteristics, as no nursery work aiming at maintaining or improving it is being done. Mention is made of five varieties of cereals bred in Latvia, in particular the ryes Priekuļi and Stende II, the oat Mičurinec [Mičurinist] and the barley Kombajner [Combine].

1370 Cicin, N. V.
(**Grain farming in the USSR**).
Priroda (Nature), Leningrad 1959 : No. 7 : 3–12. [Russian].

Mention is made of new forms of wheat, rye and barley obtained by crossing these crop plants with *Agropyron* or *Elymus* spp. Among the *Triticum* x *Agropyron* hybrids are winter wheats with branched ears which will shortly become available on farms and a new form of wheat yielding grain and forage of high protein content.

1371 Hoffmann, W.
Neuere Möglichkeiten der Mutationszüchtung. (**New possibilities of mutation breeding**).
Z. Pflanzenz. 1959 : **41** : 371–94.

Techniques used for the induction of mutation in cereals by ionizing rays and radioactive isotopes are discussed. Radioactive isotopes which are absorbed by the plant, such as P^{32} and S^{35}, have been found to be particularly valuable in mutation breeding and some of the effects of P^{32} are described. A recommended procedure for tracing large numbers of mutations is the "single-grain bulk method"; this involves keeping only one or a very small number of individual plants of $M_2(X_2, \beta_2$ or $\gamma_2)$ progenies but the number of progenies tested is high. This method has given good results with winter wheat when successive generations were irradiated. Mention is made of some of the results hitherto obtained in mutation breeding with cereals, and further possibilities of improvement by mutation are discussed.

Ernst-Schwarzenbach, M.
Achtzehnter Jahresbericht der Schweizerischen Gesellschaft für Vererbungsforschung Société Suisse de Génétique (S.S.G.) 1958. (**The eighteenth annual report of the Swiss Society for Genetical Research, 1958**).
Arch. Klaus-Stift. VererbForsch. 1958 : **33** : Pp. 335–450.

1372 *Oehler, E. Die Zytogenetik der Getreidearten.* (*Cytogenetics of cereal species*). (*pp. 342–66*).

This detailed review covers the results of cytogenetical studies of *Triticum*, *Aegilops*, *Haynaldia*, *Secale*, *Agropyron* and members of the Hordeinae, reference being made to the cytological behaviour of interspecific and intergeneric hybrids. Evolutionary relationships are considered.

1373 Tarakanov, K. N.
(Historical-ecological characteristics of meristem tissues of some northern and southern barley and wheat varieties).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1959 : **20** : No. 1 : 56–60. [Russian].

The effects of 14 hr. photoperiods and continuous darkness at temperatures of 5–8° C. and 25–28° C. upon mitosis in the root meristems of wheat and barley varieties bred (1) in the south of the USSR and (2) in the Far North were studied and the results are presented in tabular form. The conclusion is that plants originating in the north and in the south have evolved meristem tissues of different kinds. In the former, mitoses were far more frequent in plants grown at 5–8° C. in 14 hr. days than in those grown in continuous darkness, while in the latter most mitoses were observed after treatment with continuous darkness.

1374 Rommel, M.
Die Anwendung von Embryokultur, Vernalisation und Colchicin zur Herstellung amphipolyploider Gramineen-Bastarde. (**The application of embryo culture, vernalization and colchicine to the production of amphipolyploid Gramineae hybrids**).
Züchter 1959 : **29** : 239–41.

The technique for embryo culture described here has been reported elsewhere [cf. XXVIII, 4007]. Embryos of winter forms are vernalized. When they are 4–5 cm. long, the embryos, which are cultured on an agar medium, are kept for 5–6 weeks at + 2° C. and then given continuous illumination for 1–3 days at 25–27° C. Afterwards the embryos with good root development are laid in a 0·1% colchicine solution, the treatment lasting for 1½ hr.; only the shoots are treated if the root development is poor. The seedlings are planted in earth after the first colchicine treatment, and the survivors receive a second treatment, the solution being injected into the shoots. Plants which tiller well receive a third treatment; they are surrounded by cotton wool soaked in colchicine solution for 5–6 days. Tillering of the treated plants is encouraged by keeping them at 12–14° C. and supplying a 14 hr. photoperiod each day. Using these techniques good results have been obtained in producing interspecific hybrids of *Triticum* with polyploid sectors.

1375 Pinthus, M. J.
Observations on the phenology of spring wheat, barley and oats.
Bull. Res. Counc. Israel : Sect. D. 1959 : **7** : 71–80.

Wheat, oats and barley, each represented by an early and late variety, were sown on seven successive dates from November to June at Rehovot, Israel. Numbers of days from emergence to jointing and from jointing to heading were correlated with temperature and day length. Genotypic differences between the early and late varieties in dates of jointing and heading and differences in the interaction of the genotypes of these varieties with temperature and day length were estimated on the basis of differences between the multiple regression equations.

1376 Budkov, A. F. & Zadorkin, N. T.
(Against dilettantism in production of élite seed).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 1 : 32–36. [Russian].

The production of élites of such plants as wheat, buckwheat, rye, pea and sunflower is discussed in relation to continuous selection and other nursery methods which cannot be expected to be employed on a farm. Mutations and cross pollination are mainly responsible for deterioration of a variety, especially of unstable hybrid varieties. The buckwheat Bogatyr' [Hero] and Lisicyn's rye are mentioned among varieties which are most liable to become impure as a result of hybridization. Varieties obtained by single plant selection normally remain homozygous for a longer period and deteriorate less quickly.

1377 Grafius, J. E. & Wiebe, G. A.
Expected genetic gain in yield in small grain. A geometrical interpretation.
Agron. J. 1959 : **51** : 560–62.

When yield is represented as the volume, *W*, of a rectangular parallelepiped whose edges, *X*, *Y* and *Z*, respectively represent number of heads per unit area, number of kernels per head and average kernel weight [cf. XXVII, 1664], it can be shown that it is generally better to concentrate on increasing one edge when the expected genetic gain for the other two is low, but that if these are high it may be better to select for two or even three components at a time. Formulae for determining the best selection procedure are given, both for when *X*, *Y* and *Z* are independent and for when they are dependent. In addition, a formula for the maximum value for yield in the event of negative correlations is included.

1378 Atkins, I. M. & Futrell, M. C.
Diseases of small grains in Texas.
Bull. Tex. agric. Exp. Sta. 1958 : No. 921 : Pp. 20.

Brief descriptions are given of the most important diseases of wheat, oats and barley. The names of resistant varieties are given where they exist.

1379 Björkman, I.
Fysiologiska raser av stråsädesrost i Sverige 1958. (**Physiological races of cereal rust in Sweden, 1958**).
Bot. Notiser 1959 : **112** : 433–40.

In continuation of studies reported earlier [cf. 253], it is reported that races 17, 21 and 133 of wheat stem rust were found, race 21 occurring in 80% of the samples. Among wheat leaf rusts, races 107 and 57 were the most common. The oat stem rusts 3, 7, 6 and 6A were more frequent than the other four races found. Nineteen races of oat crown rust were found, of which 228 was predominant, followed by 231 and 239.

1380 Stewart, D. M., Cotter, R. U., Roberts, B. J. & Christensen, J. J.
Physiologic races of *Puccinia graminis* in the United States in 1958.
Plant Dis. Reptr. 1959 : Suppl. 258: 189–96.

A total of 27 races and subraces of wheat stem rust was isolated, races 56, 11 and 15B being the commonest. In the spring-wheat areas, 15B comprised 45% of the isolates, and 70% of these were biotypes to which Golden Ball is susceptible and which are particularly virulent on the durum wheats Ramsey and Towner.

A culture of race 34 which can attack both seedlings and adult plants of Selkirk was isolated from this variety.

Subrace 48A was found to attack certain lines of Frontana x (K58–Newthatch). Lines II–50–16, 21, 29 and 35 were immune or only showed necrotic flecks.

A culture of race 15 was isolated from the durum wheat St.464; line II–50–17 of Frontana x (K58–Newthatch) was susceptible to this culture.

Among isolates from the Pacific North West, 15 races and subraces were identified, six of them not found elsewhere in the USA. Race 11 was most prevalent.

Seven races and one subrace of oat stem rust were identified, race 7 being the most prevalent. Race 8 was identified for the first time in California and severely damaged the varieties Indio and Ventura.

Race 6 now appears to have become established independently of the barberry.

WHEAT

1381
Winter wheat varieties—1955/58.
Rur. Adv. Leafl. Edinb. Sch. Agric. No. 43 : Pp. 3.

A report is given on the performance of Minister, Yga, Welcome and Heine VII, with Cappelle as control, in the Lothians and Berwickshire, Scotland. Cappelle gave the highest yield.

1382 García Pozuelo, E.
Ensayos comparativos de rendimiento de trigos de origen híbrido (1956–57). [**Comparative yield trials with wheats of hybrid origin** (1956–57)].
An. Inst. nac. Invest. agron., Madr. 1959 : **8** : 9–53.

Further tests [cf. XXIX, 1376] of hybrid selections, including Aradi, Canaleja, Canti, Saria and Floreal, are reported. Canti yielded particularly well in Cuenca. Among the newer hybrid selections, 447 was best in the two localities in which it was tested and, in Ilundain, 292–1 (Castilla 3–3 x Honosuh) surpassed Navarro 122, which is usually the best variety.

1383 Sortsforsøg med vårhvede 1954–58. (**Varietal trials of spring wheat, 1954–58**).
Tidsskr. Planteavl 1959 : **63** : 551–52.

Of four varieties tested at four Danish stations, Peko yielded well at all stations and was lowest in lodging tendency.

1384 Zomertarwe, 1960. (**Spring wheat, 1960**).
Landbouwvoorlichting **16** : Bijl. 55; Ber. Rassenkeuze 1959 : No. 272 : unpaginated.

Relative yields are reported for seven varieties tested on different soil types in the Netherlands; notes on performance are also given. The new variety Opal, previously known as Triesdorfer, gave good yields, particularly on sandy and valley soils. MGH50–14, newly admitted to the trials, showed promise on clay soils.

1385 Săulescu, N.
Orizonturi noit în ameliorarea grîului de toamnă. (**New horizons in the improvement of winter wheats**).
Probl. Agric., București 1958 : **10** : No. 2 : 57–61.

Rumanian projects, having as their aim the improvement of specific yield components, earliness, and resistance to lodging, Hessian fly and fungous diseases, are shortly reviewed. Hybridization between locally adapted varieties and recently bred Italian and American varieties possessing the characteristics cited above is recommended.

1386 van der Merwe, J. J.
Wheat varieties for the Northern Transvaal irrigation areas.
Fmg. in S. Afr. 1959 : **35** : No. 8 : 10–12.

Twenty-two varieties were investigated and their characteristics are tabulated. Recommended varieties are listed in order of importance for early, mid-season and late plantings.

1387 Hamilton, D. G.
Improving Canada's wheat.
Agric. Inst. Rev. 1959 : **14** : No. 6 : 18–22, 53.

A critical review is given of research progress in Canada. The use of amphiploids as gene sources, the maintenance of genetic stocks and chromosome substitution studies are discussed. The need for more accurate techniques for early generation selection and for more fundamental research is stressed.

1388 (**The oldest plant breeder of Kirgizia**).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1959 : No. 2 : p. 46. [Russian].

Several wheats bred in Kirgizia by Ryžej, who has recently celebrated his fiftieth year as a plant breeder, are listed. They include the winter wheat Erythrospermum 132 which yields up to 30 c. per ha. under rainfed conditions in the provience of Frunze.

1389 Kiriyama, T., Yoshitomi, K. & Fukuoka, H.
(**Variation in genetical statistics in wheat due to environment**).
Kyushu Noygo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1959 : **5** : 221–27. [Japanese].

From experiments using 16 varieties and three treatments, (1) normal, (2) heavy application of fertilizer, and (3) late sowing, estimates were made of genetic variance, environmental variance and the interaction variance. The latter was statistically significant for yield, heading date, culm length, and ear length, but not for number of ears, weight per ear, spikelet number or ear density. The effect of the interaction on heritability estimates, genotypic and phenotypic correlations and selection indices is discussed.

1390 Sears, E. R.
Neatby's virescent, a chlorophyll aberration in common wheat.
Genetics 1959 : **44** : p. 534. (Abst.).

A mutable recessive gene first described by Neatby causes virescence [IV, 132]. Aneuploid analysis has shown that one dose of this gene (*v*) has little or no effect while two doses result in virescence and three in albinism. The gene also has the effect of retarding growth, especially with three doses. Its apparent mutability is the result of nondisjunction of chromosome III, which carries *v*. When the homologous chromosome XVI is monosomic, *vv* has a lethal effect on the embryo. When XVI is tetrasomic, *vv* plants are green. The other homeologue, XII, has an effect, when monosomic, similar to mono–III, except that some mono–XII *vv* individuals are weakly viable throughout development. Chromosomes XII and XVI therefore carry genes which compete with *v*. *V*, the normal allele of *v*, is apparently similar in this respect to the genes on XII and

XVI, mono–XVIV*v* —, but not mono–XVI *Vv*, being an embryonic lethal. The possibility is being tested that XII and XVI carry V_2 and V_3, respectively, which are essentially duplicates of V_1 on III. Involved in chlorophyll formation, the three genes are functionally similar but differ somewhat in strength [cf. XXVIII, 4053].

1391 Schmalz, H.
Subvitale F_1-Kombinationen beim Weizen. I. Genetische Untersuchungen. **(Subvital F_1 combinations in wheat. I. Genetical investigations).**
Züchter 1959 : **29** : 207–17.

F_1 hybrids of certain wheat crosses have been found to suffer an early death, the plants beginning to wither at the three-leaf stage. Since the hybrids usually produce progeny, subvitality is thought to be a better term than sublethality for this condition. In studies of 247 crosses involving 84 spring and winter wheats, it was found that F_1 generations were generally uniform as regards the expression of subvitality. However in crosses involving the variety Garnet, some normal plants occurred amongst otherwise subvital generations; Garnet plants apparently differed in the genes controlling the subvital condition. F_1 plants of different crosses also varied in the expression of subvitality.

The F_2 generations of 20 crosses segregated generally into 9 subvital: 7 normal plants; this indicated that two dominant complementary genes (*A* and *B*) are responsible for subvitality. F_3 generations segregated in a similar way. On the basis of the F_1 results, seven varieties are thought to have the genotype *AAbb*, 22 have *aaBB*, 25 have *aabb* and 30 could not be classified. The varying degrees of wilting observed in F_1 generations may be due to the occurrence of multiple alleles of *A* and *B* differing in their effect or there may be modifying factors present. A third possibility is that the *A* and *B* factors interact with the "gene milieu."

1392 Matsumura, S., Nezu, M. & Koshiba, Y.
(Genome analysis of *Triticum dicoccum* subsp. *georgicum* Dek. et Men.).
Seiken Jiho/Rep. Kihara Inst. Biol. Res. 1958 : No. 9 : 39–48. [Japanese].

Crosses between the above wheat and other wheat species resulted in hybrids whose modal meiotic configurations were as follows: with *T. monococcum*, $6_{\text{II}} + 9_{\text{I}}$; with *T. turgidum* and *T. durum*, 14_{II}; with *T. vulgare*, $14_{\text{II}} + 7_{\text{I}}$ and $1_{\text{III}} + 13_{\text{II}} + 6_{\text{I}}$; with *T. macha*, $1_{\text{IV}} + 12_{\text{II}} + 7_{\text{I}}$; and with *T. timopheevi*, $1_{\text{III}} + 11_{\text{II}} + 3_{\text{I}}$, though, in this last case a very wide range of configurations was observed. It is concluded that var. *georgicum* is an Emmer wheat of genomic constitution AABB.

1393 Larson, R. I.
Inheritance of the type of solid stem in Golden Ball (*Triticum durum*). I. Early generations of a hybrid with Rescue (*T. aestivum*).
Canad. J. Bot. 1959 : **37** : 889–96.

In the F_2 of Rescue x Golden Ball, both parents being solid-stemmed, the more solid top internode of Golden Ball was associated with dense ear and morphological resemblance to *T. durum*. Rigorous selection failed to give an F_4 line with a top internode as solid as that of Golden Ball, combined with the morphological characteristics of *T. aestivum*. Possibly genome D tends to inhibit pith production in the top internode. Probably as the result of segregation of genes in genomes A and B, two F_4 lines showed an increase in solidity of the top and lower internodes, compared with Rescue, and some F_4 lines differed from either parent in pattern of pith distribution. Segregates with stems less solid than those of either parent appeared in the F_2 and three fairly hollow, dwarf F_4 lines were obtained. Hollowness was probably caused by a combination of aneuploidy for chromosomes in genome D and segregation of genes in genomes A and B. F_4 lines with reduced solidity compared with Rescue showed more plant-to-plant variation in pith content than this parent and the more solid F_4 lines. Golden Ball was the least variable.

1394 Matsumura, S., Muramatsu, M. & Sakamoto, S.
Genome analysis in *Agropyron*, a genus related to *Triticum*.
Seiken Jiho/Rep. Kihara Inst. Biol. Res. 1958 : No. 9 : 8–16.

This is the text of the paper contributed to the Tenth International Congress of Genetics [XXIX, 1049].

1395 Tsunewaki, K.
A ring chromosome in an F_1 hybrid between wheat and *Agropyron*.
Canad. J. Bot. 1959 : **37** : 1271–76.

A ring chromosome was found in the root tips of the hexaploid hybrid *Triticum aestivum* x *Agropyron glaucum*. The irregular meiotic behaviour observed in *A. glaucum* suggests that the ring chromosome originated from this parent.

The size of the ring chromosome did not appear to influence the rate of elimination and about 80% of these chromosomes were eliminated from seedlings after 26 days.

1396 LAPIN, P. I.
(The opening of the Principal Botanic Garden).
Vestn. Akad. Nauk SSSR (Rep. Acad. Sci. USSR) 1959 : No. 8 : 80–83. [Russian].

Mention is made of work on distant hybridization at the above institute, which has recently been opened to the public. The wheat-*Agropron* hybrid 56 was made a spring-wheat standard in the arid south-eastern districts of Russia in 1958. The area under hybrids 1, 186 and 599, which are grown as winter crops, has been greatly expanded.

1397 BEVER, W. M.
Wheat-Agropyron hybrids a possible source of resistance to loose smut.
Ill. Res. 1959 : **1** : No. 2 : p. 18.

Wheat x *A. elongatum* selections were tested for reaction to races 1, 5, 6, 7, 11 and 16 of *Ustilago tritici* at the Illinois Agricultural Experiment Station. All the wheat-like selections were susceptible to one or more races but none was susceptible to all six. Selections predominantly of the *Agropyron* type were resistant or immune to all six races.

1398 BOROJEVIĆ, S.
Vegetativna hibridizacija žitarica metodom kalemljenja klice. **(Vegetative hybridization of cereals by the method of embryo transplantation).**
Arh. poljopr. Nauk. 1959 : **12** : No. 35 : 52–62.

Experiments at Novi Sad on transplanting wheat embryos to rye plants, from which the embryo has been removed but the endosperm and the rest of the plant left intact, are described. Changes were observed in the colour of the grain in the F_0 and F_1 but the F_2 plants were indistinguishable from the wheat variety which provided the embryo.

1399 ENČEV, JA. & CVETKOV, S.
(Changing the inheritance of some cereal crops by means of vegetative hybridization).
Selskostopan. Misăl 1959 : **4** : 69–75. [Bulgarian].

An account of Bulgarian experiments on vegetative hybridization involving transplantations of wheat or rye embryos on to endosperms of other wheats or ryes is given. The changes observed in the transplanted component affected such characters as tillering, earing, plant height, length and compactness of ear, ear colour, grain shape and fertility. Incompatibility between wheat and rye was reduced and grain setting, growth and development of the plants and fertility were improved by comparison with sexual hybrids. The hybrids had some new characteristics present in neither parent.

1400 MOTRENKO, T. G.
(The question of improving the heritable properties of winter wheat by means of late autumn sowing and vernalization).
Agrobiologija (Agrobiology) 1959 : No. 1 : 100–06. [Russian].

Experiments on improving winter hardiness and increasing the yields of Hostianum 237, Vorošilovskaja, Zernogradka and Odessa 3 by the above methods at Rostov are described. The results were negative.

1401 JAKUBCINER, M. M.
(Intravarietal selection of wheat, an important reserve for the improvement of old varieties and the production of new ones).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 1 : 8–14. [Russian].

The value of selection, whether single-plant, family, group or mass selection, as a method of breeding improved varieties of spring and winter wheat is illustrated by listing many varieties obtained in this way in the Soviet Union and in several countries of eastern and western Europe and the British Commonwealth. The initial forms and the new selections are described. It is stated that, in general, hybrid varieties give rise to the most valuable new cultivars. The Soviet varieties Novoukrainka 84, Skorospelka 3b [Early 3b] and Bezostaja 4/1 [Awnless 4/1] are particularly mentioned in this connexion [cf. XXVI, 2239]. Other recent Soviet selections with high yields, large grain, and resistance to frost, drought, pests or diseases include the winter wheats Kahi 8, selected from local material in Georgia, Ferrugineum 22, a selection of Karmir Slfaat in Armenia, Vargisi, selected from the American cultivar Nebred in Georgia, and Akuotuotej, selected from Moscow 2411 in Lithuania; among the improved spring wheat cultivars are Vartanik 1, a selection from a local Armenian variety, Leningrad and Gražučaj, both selected from Preston, Dvina, a selection of Severodvinskij 1 [North Dvina 1], and

Primor'e 4, which was selected from the American double cross hybrid 11–10–7.

1402 FITZGERALD, P. J. & MCKAY, H. C.
Itana and Columbia. New hard red winter wheats for Idaho.
Bull. Idaho agric. Exp. Sta. 1959 : No. 297 : Pp. 5.

Further information is given on Columbia and Itana, two improved hard red winter wheats. Itana was developed from a cross of (Blackhull x Rex) x Cheyenne. Columbia was developed from the cross (Rio x Rex) x Nebred. [Cf. XXIX, 3672].

1403 POLANO, P.
Contributo al miglioramento della produzione del grano duro in Sardegna. Comportamento biologico e produttivo di cultivar "elette" e "locali". (**Contribution to the improvement of the yield of hard wheat in Sardinia. Biological and yielding behaviour of selected and local cultivars**).
Stud. Sassaresi : Sez. III 1958 : **6** : 50–75.

The mean yield of *Triticum durum* in Sardinia is 9·8 c. per ha. and that of *T. aestivum* is 10·5 c., though under favourable conditions yields of 27–30 c. have been obtained from modern cultivars. On the basis of trials of 21 cultivars in Nurra in north-eastern Sardinia in 1956–58, data are given for tillering, habit, cold resistance, time of earing, flowering and maturity, yields of straw and grain and the characteristics of the grain. The local cultivars, including Cappelli and Dauno III, were taller than the modern pedigree varieties. Resistance to late cold spells was greatest in Sabaudia, Cappelli, Capeiti 8 and Patrizio 6 among the pedigree varieties and in Biancale and Ruiu sicilianu [Sicilian Red] among the local cultivars; lodging was least in the short-strawed varieties such as Capeiti 8, E–2 and Patrizio 6. The highest yield of grain was given by Capeiti 8 and Patrizio 6, with over 30 c. per ha. in both good and bad years; in bad years Dauno III, Biancale, Grifoni 235, Russello SG7 and Cappelli gave good yields and in good years Trigu sardu [Sardinian wheat], Mappamondo, Cappelli and Garigliano. E–2, D–77 and Duro M [Hard M], tested for one year only, yielded well. The yields of the local varieties varied more in the different years. Duro SG3, Patrizio 6 and Capeiti 8 showed the least reduction in grain size resulting from excessive heat. Several varieties, including Cappelli, Russello SG7 and Ruiu sicilianu, were relatively free from mealy endosperm. In grain quality Cappelli, Russello SG7 and Trigu ruzzu [Land wheat] were classed as best; the early, short-strawed cultivars Capeiti 8, Patrizio 6, E–2 and Grifoni 235 were all inferior to Cappelli in quality, so that Cappelli and Dauno III are considered to be still the best hard wheats available for Sardinian growers.

1404 Nuove razze di grano. (**New wheat varieties**).
Progr. agric., Bologna 1959 : **5** : 812–13.

Synoptic descriptions are given of the following new varieties: CM114 (Marchetti 114 x Mazzoldi), a "late-early" type; Argento [Silver] (Mara x Impeto), an early-early wheat; Argelato (Mara x Orlandi), another early-early type for highly fertile soils; and Ancona mutico [Awnless Ancona], an early-early awnless selection of Ancona.

1405 CIFERRI, R. & BONVICINI, M.
Revisione delle vecchie razze italiane in rapporto ai frumenti mediterranei. I.—*Triticum aestivum* L. (**A survey of the old Italian varieties in relation to Mediterranean wheats. I. *T. aestivum* L.**).
Ann. Sper. agr. 1959 : **13** : No. 5 : Suppl. : lix–cliv.

Descriptions, together with illustrations and a descriptive formula based on a system previously described [cf. IX, 1028], are presented for a number of wheats that were cultivated in Italy and Sicily in 1927 and displayed at the Rome exhibition in that year.

1406 L., Z.
Come si evolvono le preferenze per le varietà elette di frumento. (**How the preferences for pedigree varieties of wheat are developing**).
G. Agric. 1959 : **69** : p. 401.

In a competition for the highest wheat yield at Forlì in southern Italy it was announced that the average wheat yield for Italy in the last five years was 18·6 c. per ha. compared with 14·5 c. for the period 1934–39. Twelve cultivars of bread wheat account for 70% of the area, the most popular of all being S. Pastore, followed by Mara, Funo and Autonomia A and B. Among the hard wheats Cappelli remains in the ascendant but the new variety Patrizio is gaining in popularity.

1407 Nuove razze di grano. (**New varieties of wheat**).
Progr. agric., Bologna 1959 : **5** : p. 928.

Tabular descriptions and illustrations of four recent Italian wheat varieties are presented.

They are Ovest [cf. XXVI, 254], Elia [XXVI, 2222], Lonigo 1 (S. Pastore x Bandia 1642/51) and T53 Faenza (Mentana x Damiano). The last named is stated to be highly resistant to rusts and lodging and Lonigo 1 to be resistant to cold.

1408 BONFIGLIOLI, O.
3º anno di prova delle razze di grano italiane in Jugoslavia. (**The third year of trials with Italian wheat varieties in Yugoslavia**).
Sementi elette 1959 : **5** : No. 6 : 12–24.

Further data [cf. XXIX, 2464] are presented for the season 1958–59; they confirm the superiority of certain cultivars such as S. Pastore, S. Marino, Étoile de Choisy [Choisy Star] and I.BO911, to which group certain others are now added, viz. T22, Leonardo, Leone [Lion] and Marimp 3 and 8. The mean yield of the Italian varieties was 39 c. per ha., that of the local varieties being only 15·5 c.; information is given on the resistance to cold, *Puccinia triticina*, *P. glumarum*, *Erysiphe graminis* and lodging and on baking quality in the respective cultivars.

1409 FAJERSSON, F.
I växtförädlarens verkstad. (**In the plant breeder's workshop**).
Lantmannen, Stockholm 1959 : **70** : 830–32.

An outline of the selection and testing of Starke since the parental cross was made in 1946 is presented [cf. XXIX, 2467].

1410 PINTO, F. F. & THORPE, H. C.
Identification of red wheat varieties in Kenya.
1959 : Pp. 43.

Descriptions are given of 24 red wheats, together with a key for their identification.

1411 COMPTON, L. E., CALDWELL, R. M., SCHAFER, J. F. & PATTERSON, F. L.
Laporte soft red winter wheat.
Res. Bull. Purdue Univ. 1959 : No. 682 : Pp. 19.

The origin, field performance and milling and baking qualities of LaPorte are described in detail [cf. XXIX, 278]. The named varieties involved in its parentage were Hope, Hussar, Trumbull, Fulhio, Purkof and Fultz Sel. (CI11845).

1412 **Monon is new early Indiana wheat.**
Crops & Soils 1959 : **12** : No. 2 : p. 20.

This soft, red, winter variety was developed by the US Department of Agriculture and Purdue University. It grows more rapidly and matures earlier than any other present Indiana variety; also Monon is more winter hardy and is resistant to Hessian fly, soil-borne mosaic and leaf rust. It is susceptible to stem rust but may escape severe damage because it matures early. In all areas of Indiana, Monon has yielded well and has strong stiff straw.

1413 **New wheat for Indiana.**
Agric. Res., Wash. 1959 : **8** : No. 5 : 15–16.

Monon, a new Hessian-fly resistant variety of soft red winter wheat, has been developed cooperatively by the United States Department of Agriculture and the Indiana Agricultural Experiment Station. The new variety is two to three inches shorter and is stiffer-strawed than commercial varieties grown in Indiana at present. Yield compares well with that of Dual.

Monon is fast growing in autumn and spring and matures early. It is resistant to soil-borne mosaic and leaf rust, moderately resistant to powdery mildew but susceptible to races of loose smut common in Indiana. Its resistance to Hessian fly attack is derived from W38, a selection from Illinois spring wheat.

1414 CALDWELL, R. M., COMPTON, L. E., SCHAFER, J. F. & PATTERSON, F. L.
Knox and Vermillion early maturing soft red winter wheats.
Res. Bull. Purdue Univ. 1959 : No. 680 : Pp. 20.

Detailed information is given on the origin, field performance and milling and baking qualities of the above two wheats [cf. XXIX, 278], which were both developed from a series of six crosses involving as parents Chinese, Michigan Amber, Purplestraw, Minhardi, Wabash, Fultz Sel. (CI11512) and Trumbull.

1415 CALDWELL, R. M., CARTWRIGHT, W. B., COMPTON, L. E., SCHAFER, J. F. & PATTERSON, F. L.
Dual, a hessian fly resistant soft red winter wheat.
Res. Bull. Purdue Univ. 1959 : No. 681 : Pp. 20.

A detailed report is given on the breeding of Dual and its performance with respect to yield, Hessian-fly resistance and other field characters and milling and baking qualities [cf. XXIX, 278]. It was developed from a series of seven crosses in which Fultz Sel. (CI11512), Hungarian, Hope, Hussar, Purdue Sel. W38, Trumbull, Wabash and Fairfield figured as the original parents.

1416 KÜHN, F.
Rozlišování našich povolených odrůd pšenice podle klasu. (**Distinguishing our approved varieties of wheat by the ear**).
Sborn. čsl. Akad. zeměd. Věd : Řada rostlinná Výroba 1959 : **32** : 1411–22.

The morphology of the ear of Czechoslovak spring and winter wheats is described and an identification key based on ear characters is presented.

1417 MATHESON, E. M.
Dural, an Australian macaroni wheat.
Agric. Gaz. NSW 1959 : **70** : 544–46.

Further information is given on *Triticum durum* 'Dural', now in commercial cultivation in New South Wales [cf. XXIX, 3675]. It is late in ripening and resistant to flag smut and many races of leaf rust, with a moderate type of mature-plant resistance to stem rust which has so far afforded adequate protection.

1418 SWAMINATHAN, M. S. & NATARAJAN, A. T.
Effect of ultraviolet pretreatment on yield of mutations by X-rays in wheat.
Science 1959 : **130** : 1407–09.

Seeds of *Triticum aestivum* 'C591' were subjected to the following treatments: (1) ultraviolet rays (UV) for 1 hr., (2) 11000, 16000, 22000 and 33000 r. of X rays, and (3) pretreatment with UV for 1 hr. followed by exposure to the same doses of X rays as in (2). As revealed by examination of root tips of X_1 seedlings, UV pretreatment reduced the frequency of chromosome aberrations induced by all four doses of X rays. UV alone did not incite any chromosome breakage. X_2 progenies were scored for all phenotypically detectable mutations. In comparison with the results from (2), those from (3) indicated a reduction in the mutation rate at 11000 and 16000 r. and an increase at 22000 and 33000 r. Since a majority of the mutations induced in bread wheat appear to be chromosomal in origin, the effect of UV in reducing the number of X-ray-induced aberrations by promoting restitution may have been responsible for the decreased mutation rate at the two lower doses. The same consequence of UV pretreatment may also account for the increased rate at the two higher doses, since in plants treated with X rays alone at these two doses a large proportion of mutant gametes apparently carried several chromosome structural changes and were therefore either inviable or at a competitive disadvantage. This inference is supported by the fact that while X_1 plants from the 22000 and 33000 r. treatments in (2) had 15–20% pollen sterility, the corresponding plants from (3) had only 4–6%. The types of mutants and their relative frequencies were more or less similar in all treatments. The X_2 from seeds exposed to UV + 16000 r. differed, however, in containing *albina* mutants.

1419 STEINITZ-SEARS, L. M.
Derivatives of a dicentric chromosome in wheat.
Genetics 1959 : **44** : p. 539. (Abst.).

During meiosis, a spontaneous dicentric chromosome participated in the formation of a translocation trivalent. The chromosome gave rise to the following derivatives in the next generation: (1) a functionally monocentric chromosome in which the intercentromeric segment had presumably become so short as to be virtually absent, (2) two monocentric chromosomes, which were recognizably deficient for part of one arm and which originated through breakage and healing of the dicentric, and (3) a tricentric chromosome. The tricentric paired with two normal chromosomes and, with alternate orientation of the centromeres, assumed a characteristic W shape. One plant had a pair of chromosomes of type (1) and was thus nullisomic for arms of two different chromosomes of the standard line.

1420 FEDOROV, A. K.
(**Characteristics of development of first generation hybrid plants**).
Dokl. Vesesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1959 : No. 1 : 29–31. [Russian].

[Cf. XXIX, 2477].

1421 TER-AVANESJAN, D. V. & NIGMATULLIN, F. G.
(**The role of the amount of pollen in inheritance of characters and properties in wheat hybrids**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 1 : 71–73. [Russian].

In experiments at Puškin, a wheat cultivar was fertilized by (*a*) a large amount of pollen of another variety or (*b*) two pollen grains only of another variety. The percentage of F_1 plants resembling the ♀ parent was higher in the second treatment. Observations on soft-wheat hybrids showed that some characters of the ♂ parent were not transmitted to the F_1 after fertilization by two pollen grains. Thus no plants with tough straw and long ears, which occasionally occurred in the ♂ parent variety and its progeny when used as male parent supplying a large amount of pollen, were found. The F_1 plants in treatment (*b*) had shorter straw than hybrids in the other treatment. No difference was observed between the two kinds of F_1 hybrids in heading, ear length and number of spikelets in the main ear. The inheritance of characters in the F_1 was as expected, except for 5·8% of soft wheat hybrids in treatment (*b*); these had white (recessive) ear colour instead of red. Most of these hybrids had a different mode of segregation from the hybrids obtained by fertilization with a large amount of pollen and showed greater variability in quantitative characters. Productive families, with longer ears, greater number of spikelets in the main ear and more grain per plant, were selected in the F_2.

1422 SETH, J.
Factors affecting varietal differences in protein content of wheat.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–351 : 2710–11. (Abst.).

Investigations were carried out on two varieties with a high and two varieties with a low protein content. Translocation of nitrogenous compounds from the vegetative parts to the ears and rate of increase in protein content of the kernels had some influence on varietal differences in protein content. Varietal differences were not related to root growth, the rhizosphere, ability to reduce nitrate N or light conditions. Percentage of total nonprotein N was higher for the low-protein varieties than for those high in protein. Under field conditions, high protein content of the kernels was positively correlated with lateness of heading in one cross; in another it was noted that awnedness and protein content were not correlated.

1423 VOLODIN, V. G.
(Studying invertase activity in wheat ovaries from different pollination treatments).
Bjull. Inst. Biol. Akad. Nauk Belorussk. SSR (Bull. Inst. Biol. Acad. Sci. White Russ. SSR) 1956 (1957) : No. 2 : 226–29 : from Ref. Ž. (Ref. J.) 1958 : No. 13 : Abst. 57188 : p. 30. [Russian].

Invertase activity in two-day-old ovaries of the spring wheat Lutescens 062 was investigated. It was found that emasculation considerably reduced the activity of this enzyme. In other experiments where the ears were bagged and fertilized by the pollen of the same or another variety, no change in invertase activity was observed.

1424 KOEDŽIKOV, H.
(Wheat, a high yielding crop).
Kooper Zemed. (Cooper. Fmg.), Sofija 1959 : No. 1 : 16–17. [Bulgarian].

Varietal differences in the number of florets per ear in wheats grown in Bulgaria are referred to. Sadovo, Åkerman, Jubilejna II [Jubilee II] and Jubilejna III are among the varieties having many florets.

1425 ROVENSKÁ, B.
Průduchy na listech některých uznaných československých odrůd pšenice (*Triticum vulgare* Vill.). [**Stomata on the leaves of some approved Czechoslovakian varieties of wheat (*T. vulgare* Vill.)**].
Sborn. čsl. Akad. zeměd. Věd: Řada rostlinná Výroba 1959 : **32** : 1091–100.

Considerable variation within varieties was found in the number of stomata on both sides of the leaves. It is concluded that varieties cannot be distinguished by counts of stomata.

1426 HÝŽA, V. & VLACH, M.
Výsledky sledování jakosti světového sortimentu ozimých pšenic. (**Results of an investigation of the quality of the world collection of winter wheats).**
Sborn. čsl. Akad. zeměd. Věd: Řada rostlinná Výroba 1959 : **32** : 1117–36.

The results of technological studies of 389 varieties from several countries are presented in tabular form; the varieties were grown under uniform conditions in Kroměříž.

1427 MEL'NIKOV, N. I.
(Studying the technological properties of wheat varieties—by modern standards).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 1 : 25–27. [Russian].

The breeding of strong-floured wheats and the introduction of quality testing in state varietal trials is urged. It is regretted that Ukrainka and other high-quality varieties have in recent years been largely superseded by "fillers" such as Odessa 3. The need for modern laboratory equipment for testing the baking and milling properties at breeding institutes is emphasized.

1428 Prugar, J., Horel, J. & Hýža, V.
Hodnocení technologické jakosti pšenice I. Nový způsob bonitace pšeničného zrna po stránce pekařské hodnoty. (**Evaluation of the technological quality of wheat. I. A new way of evaluating wheat grain with respect to baking quality**).
Sborn. čsl. Akad. zeměd. Věd: Řada rostlinná Výroba 1959 : **32** : 1137–44.

The simple and objective method described involves determining the gluten content and its swelling capacity; baking quality is expressed as a single number. Only a small quantity of grain is required and the results agree with those obtained using the farinograph method or a baking test.

1429 Prugar, J.
Hodnocení technologické jakosti pšenice II. Výpočet obsahu suchého lepku z lepku mokrého s uvážením jeho fyzikálních vlastností (bobtnavosti). [**Evaluation of the technological value of wheat. II. Calculation of the content of dry gluten from wet gluten in relation to its physical properties (swelling capacity)**].
Sborn. čsl. Akad. zeměd. Věd: Řada rostlinná Výroba 1959 : **32** : 1145–50.

Hitherto a coefficient of 3·0 has been used to calculate the content of dry gluten from that of wet gluten. It has now been found that this value depends on the physical properties of the gluten; it varies between 2·6 for gluten with a high swelling capacity and 3·15 for gluten with no swelling capacity. The coefficient 3·0 is only valid for a swelling capacity of six degrees. A graph is presented from which the appropriate coefficient for any swelling capacity can be read for wet gluten contents above and below 30%.

1430 Pradáč, J.
Příspěvek k osvětlení fyzikálně chemických vlastností lepku v souvislosti s jeho jakostí I. Důkaz vlivu poměru gliadinu a gluteninu na jakost pšeničné mouky. (**A contribution towards shedding light on the physicochemical properties of gluten in relation to its quality. I. Evidence of the effect of the ratio of gliadin and glutenin on the quality of wheat flour**).
Sborn. čsl. Akad. zeměd. Věd: Řada rostlinná Výroba 1959 : **32** : 1151–58.

In experiments with flour from two varieties, it was shown that the proportions of gliadin and glutenin in the gluten are important in determining the quality of the gluten; also the physical structure of the glutenin has some effect on quality.

1431 Popescu, S.
Noi metode pentru determinarea însuşirilor de panificaţie ale grînelor şi făinurilor de grîu stabilite în condiţiile fabricării pînii. (**New methods for determining the bread-making qualities of cereals and wheat flours under actual bread-making conditions**).
Probl. Agric., Bucureşti 1958 : **10** : No. 6 : 43–48.

In order that laboratory tests of baking quality should simulate ordinary bread-making conditions more closely, it is suggested that 1·5% common salt and 0·3% lactic acid should be added to the dough.

1432 **World catalogue of genetic stocks. Wheat.**
FAO, UN, Rome 1959 : Suppl. No. **7** : Pp. iii + 20.

This supplement contains contributions from Canada, Germany, Italy, Jordan, Morocco, Pakistan, the United Kingdom and the USA [cf. XXVIII, 265].

1433 Sikka, S. M. & Jain, K. B. L.
Correlation studies and the application of discriminant function in *aestivum* wheats for varietal selection under rainfed condition.
Indian J. Genet. 1958 : **18** : 178–86.

These studies were carried out on 40 varieties including New Pusa and Provincial wheats and hybrid selections in advanced generations. Grain yield was positively and significantly correlated with number of ears per plant, number of grains per ear and 1000-grain weight; the standard partial regression coefficients showed that these three characters are equally important in determining grain yield. The correlation between yield and earing date was positive but not significant. Grain number per ear showed a high negative correlation with ear number and a high positive correlation with earing date. Heritability in the broad sense was 88·8% for earing date, 81·7% for 1000-grain weight and 30·6% for grain number; grain yield and ear number had low heritabilities. It was found that discriminant formulae based on yield components alone or in combination with earing date and grain yield did not give better scores of genotypic value than the yield alone.

1434 ASANA, R. D. & MANI, V. S.
Analysis of drought resistance in crop plants. II. The influence of soil-drought on the relation between yield and ear characters in wheat (field experiments).
Indian J. Genet. 1958 : **18** : 187–98.

The results from three of the four field experiments described confirm the following conclusions drawn previously from the results of pot experiments [cf. XXVIII, 425]. Under conditions of adequate soil moisture, ear number was the most important yield component, but, where soil moisture was restricted, grain number per ear and sometimes 1000-grain weight were as important as ear number.

1435 GOTO, K. & OSANAI, S.
(**Crop-plant density and efficiency of selection**).
Ikushugaku Zasshi/Jap. J. Breeding 1959 : **9** : 7–11. [Japanese].

An F_3 bulk of the wheat cross Dawson 1 x Purcam was divided into three lots, a, b and c, sown at densities of 164, 88 and 44 grains/m^2. respectively. Selection for ear number was effected in all treatments and the progenies grown under similar conditions to their parents in the F_7. This generation was selected for yield and the F_8 progenies from each treatment compared in a randomized-block design.

It was found that yield and ear number were highest in the progenies of plants subjected to treatment c. Phenotypic and genotypic correlations were calculated between (1) yield and ear number and (2) yield and winter hardiness for each treatment. In general, the values were high and positive for (1) and high and negative for (2).

1436 HEBER, U.
Ursachen der Frostresistenz bei Winterweizen. III. Mitteilung. Die Bedeutung von Proteinen für die Frostresistenz. (**Causes of frost resistance in winter wheat. III. The significance of proteins for frost resistance**).
Planta 1959 : **54** : 34–67.

It was found that only a certain proportion of the cytoplasmic protein is coagulated at low temperatures and the hardiness of a variety is inversely related to this proportion. There is no evidence that glycoproteins play an important part in protection against frost; the possible protective action of proteins is discussed. [Cf. XXIX, 1406–7].

1437 KIRIČENKO, F. G.
(**Breeding varieties and forms of hard winter wheat**).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1959 : No. 1 : 6–12. [Russian].

Breeding hard winter wheats at the All-Union Breeding and Genetics Institute has continued [cf. XXIX, 262]. In particular, mention is made of crossing the hard-wheat forms referred to in the previous report with hardy soft-wheat cultivars, employing the latter as ♀ parents. The hybrids from such crosses proved hardier and more productive than hybrids between hard winter wheats and hard spring wheat varieties. One of the hybrids, Mičurinka [Mičurinist], is nearly as hardy as Odessa 3 and had an average yield over two years of 34 c. per ha. It is resistant to lodging and shedding, has a 2–4% higher protein content than soft wheat, and makes good macaroni, gruel and flour for blending.

1438 KUSUNOKI, T. & OSANAI, S.
(**The results of mass selection of early generations of winter wheat for resistance to cold**).
Ikushugaku Zasshi/Jap. J. Breeding 1959 : **9** : 1–6. [Japanese].

The material studied comprised: the parental lines (II) Norin 8 [Ministry of Agriculture and Forestry 8], a winter-hardy variety, and U-13 (Trumbull x Frondosa), a cold-susceptible variety; 8 pedigree lines (I) selected from the F_1 hybrid of the above variety; a population bulk (IV) exposed to low natural winter temperatures in the F_2; a population bulk (V) treated similarly in the F_2 and F_3; a population bulk (VI) so treated in the F_2, F_3 and F_4; and an untreated bulk (III). In the F_6, the six populations were examined for resistance to a temperature of −24·5° C., resistance to *Sclerotinia graminearum*, and habit. As regards cold resistance, $VI > V > IV = III > II = I$; in respect of resistance to *S. graminearum*, $V = VI > I = II > IV = III$; while growth habit (prostrate → erect) followed the sequence $II = V = VI \rightarrow III = IV$. Heritabilities for the above three characters respectively were 67, 44 and 75%. Genotypic and phenotypic correlations between the three characters were calculated. Resistance to cold, resistance to *S. graminearum* and angle of growth are all positively correlated.

1439 **Semidwarf wheat shows promise.**
Agric. Res., Wash. 1959 : **8** : No. 2 : 3–4; also World Fmg., Kansas City 1959 : **1** : No. 11 : 12–13.
New wheats promise less lodging, more efficient use of plant food.
Plant Fd. Rev. 1959 : **5** : No. 3 : p. 11.

New short, nonlodging wheat varieties adapted to the high-rainfall areas of the Pacific Northwest are being developed from a number of crosses between commercial varieties and the short Japanese variety Norin 10 [Ministry of Agriculture and Forestry 10]. From the cross Norin 10 x Brevor two promising strains were developed, selections 14 and 17. While neither is suitable for commercial production owing to mildew and stem-rust susceptibility, low milling quality and poor emergence from autumn sowing, their use as parents in new crosses with high-yielding soft white winter wheats has resulted in several semi-dwarf selections highly resistant to common and dwarf bunt and moderately resistant to leaf rust and powdery mildew. In none of these semidwarf strains, however, is emergence from early autumn sowing satisfactory.

1440 Merkys, A. I.
(Investigating the oxidation-reduction system of ascorbic acid in wheat varieties differing in resistance to lodging).
Lietuvos TSR Mokslų Akad. Darb. : Ser. B 1959 : No. 3 : 123–42. [Russian].

Reduction of ascorbic acid was more intensive in lodging-resistant varieties such as 461 and Garsas; these originated from the Dutnova breeding station, Lithuania.

1441 Linnik, E. F.
(The practice of breeding winter wheat for immunity in England).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 1 : 74–75. [Russian].

An account of breeding wheats resistant to *Puccinia glumarum, Ustilago tritici, Erysiphe graminis* and *Cercosporella herpotrichoides* at the Cambridge Plant Breeding Institute, England, is given.

1442 Favero, A.
Nuovi grani. **(New wheats).**
Sementi elette 1959 : **5** : No. 6 : 53–54.

Descriptions of four Italian winter wheats are provided. Sa Marimp 3, a hybrid of Impeto x Mara, is resistant to *Fusarium* sp. and mildew and moderately resistant to cold and lodging. Sa Marimp 8, of the same parentage, is resistant to rusts, leaf spot and lodging and moderately resistant to *Fusarium* and mildew. Sa Orpas 2, from Orlando x S. Pastore, is highly resistant to lodging and moderately resistant to cold, rust, mildew and *Fusarium.* Conte Marzotto, from Mara x Impeto, is cold resistant, early and resistant also to rust.

1443 Powers, H. R. (Jun.), Schafer, J. F. & Caldwell, R. M.
A pathogenic strain of *Erysiphe graminis* f. sp. *tritici* attacking Asosan wheat.
Plant Dis. Reptr. 1959 : **43** : 762–63.

A new race, designated 2A, of *Erysiphe graminis* f. sp. *tritici* has been isolated in Indiana; it is pathogenic to the variety Asosan, CI12665, and also on others which have been used by breeders as sources of resistance to powdery mildew. On the basis of the reactions of certain differential varieties to race 2A, a genotype for pathogenicity has been formulated for it, which can be designated $V_aA_cA_tA_u$.

1444 Mitov, N.
(The problem of loose smut of wheat in our country and experiments on its practical solution).
Selskostopan. Misăl 1959 : **4** : 53–62. [Bulgarian].

A number of wheats have been tested for resistance to different physiological races of *Ustilago triticina* at Sofia and the results are presented in tabular form. Highly resistant or immune varieties included the Bulgarian winter wheat 11, the spring wheat Thatcher and four hybrids bred at the Institute of Plant Protection, Sofia. Three of the hybrids derived their immunity from Thatcher. Mercury was another introduced variety showing immunity to all races of the pathogen, while Hope, Garnet and Reward were immune from some races and highly resistant to others.

1445 Watson, I. A.
The present status of breeding disease resistant wheats in Australia.
Agric. Gaz. NSW 1958 : **69** : 630–60.

A comprehensive review is given of progress in breeding varieties of wheat resistant to bunt, flag smut, leaf rust and stem rust since the beginning of the century. Some hitherto unpublished information is given on leaf and stem-rust strains.

1446 Samborski, D. J. & Ostapyk, W.
Expression of leaf rust resistance in Selkirk and Exchange wheats at different stages of plant development.
Canad. J. Bot. 1959 : **37** : 1153–55.

Ontogenetic variations in resistance have been observed in these two resistant varieties. Since resistance break-down only occurred at maturity there was no significant reduction in yield.

1447 Johnson, T.
Kenneth William Neatby, 1900–1958.
J. Hered. 1959 : **50** : 125–26.

An obituary account is given of Neatby's achievements in the organization and scientific progress of agriculture in Canada, including his work on breeding wheat for rust resistance and on the genetics of this character.

1448 Vakili, N.-G.
A study of mechanisms of variation of pathogenicity in wheat leaf rust (*Puccinia recondita* Rob. ex. Desm. f. sp. *tritici* Eriks.).
Diss. Abstr. 1959 : **19** : LC Card Mic 58–3203 : 3103–04. (Abst.).

In genetical studies of races 104B, 76, 5 and 2 on 14 different varieties, avirulence was more frequently dominant than recessive. In race 104B, the dominant factors *B*, *L* and *K* governed virulence against the varieties Brevit, Loros and Kenya Farmer, respectively; H_1, *Wab* and M_2 controlled avirulence against varieties 36, 3369 and 4665; virulence towards Malakof was determined by M_1, dominant for virulence, together with M_2, dominant for avirulence and hypostatic to M_1; avirulence on Carina was conditioned by the complementary factors M_2 and *Ca* and on Webster by the complementary factors W_1 and W_2; and at least two factors, H_1 and H_2, governed avirulence on Hussar. A dominant factor, *C*, conditioned normal red uredospore colour and the recessive allele *c* yellow uredospores. Yellow colour was closely linked with virulence against Malakof and with avirulence against 36. Race 2 was also heterozygous for uredospore colour. Ten of the twelve factors in race 104B fell into two linkage groups, one containing M_1, *c*, H_1 and H_2 and the other M_2, *ca*, W_2, *b*, and *Wab*. In the other races studied, different genes for virulence appeared to occur. Evidence of maternal inheritance was detected in S_1 progenies obtained by reciprocal fertilization of pairs of monosporidial infections of races 2 and 5. Selfing of race 104B resulted in cultures capable of attacking 4665, hitherto highly resistant to all known races. Spores from two uredial clones, both selected from 104B but differing in spore colour and producing opposite reactions on eight differential varieties, were mixed and used to inoculate the eight differentials. From the varieties susceptible only to the yellow parent, 65 red, virulent recombinant cultures were isolated, a large proportion of which were of phenotypes that could have arisen through simple association of intact nuclei from the parents. However, evidence of the possibility of fusion, crossing over, segregation and recombination in the dicaryophase was also obtained. Eight of the recombinants were virulent on variety 3369, on which both parents were avirulent. No recombinants combined the yellow colour of the one parent with the virulence towards variety 36 of the other, due to the close linkage of yellow colour with avirulence on 36.

1449 Basile, R.
Relazione quinquennale (1953–1957) sulle razze fisiologiche di *Puccinia graminis* var. *tritici* in Italia. **[Quinquennial report (1953–57) on the physiological races of *P. graminis* var. *tritici* in Italy].**
Boll. Staz. Pat. veg., Roma 1958 : **16** : 109–19.

The data previously reported in separate notes are here brought together in tabular form. Of the 95 races isolated, 46 are new. Race 21 was the most common and one of the most virulent, whereas races 17 and 40, previously the most common, have diminished markedly. Race 189, which attacks all the differential hosts, has been isolated for the first time in Europe.

1450 Basile, R., Leonori-Ossicini, A. & Zitelli, G.
Le razze fisiologiche di *Puccinia recondita* Rob. ex Desm. [= *P. rubigo-vera* (DC.) Wint. f. sp. *tritici* (Erikss.) Carl.] identificate durante l'anno 1957. **[The physiological races of *P. recondita* Rob. ex Desm. (= *P. rubigo-vera* [DC.] Wint. f. sp. *tritici* [Erikss.] Carl.) identified during 1957].**
Ann. Sper. agr. 1959 : **13** : No. 5 : Suppl. : i-iv.

Only 33 of the 39 races previously identified [cf. XXIX, 1417] were isolated in 1957 but the virulent races 176 and 57 were of relatively frequent occurrence. A table shows the cultivars on which the different races were found.

1451 SIBILIA, C.
Ruggine nera e varietà di grano in Italia. (**Black rust and wheat varieties in Italy**).
Sementi elette 1959 : **5** : No. 5 : 24–28.

This brief review includes an account of the fluctuation in the frequency of black-rust races in Italy in recent years and mentions some sources of resistance for breeding.

1452 PAL, B. P., MURTY, G. S. & AMIR SINGH.
Recent progress in breeding for disease resistance and other characters in wheat at the Indian Agricultural Research Institute, New Delhi.
Indian J. Genet. 1958 : **18** : 116–41.

Data are provided on the performance of single, three-way and double crosses involving foreign wheats and adapted Indian varieties. The crosses (NP165 x C518) F_1 x (N245 x NP770) F_1 and E558 (Gabo) x Niphad 4 gave large numbers of superior segregates. HD(53)-146 selected from the cross E865 x NP165 proved to be suitable for cultivation at lower altitudes in Himachal Pradesh and four other strains are mentioned for their good performance under irrigated conditions. Seven strains which did well in the yield trials could resist attack by rust to a moderate degree as mature plants even under optimum conditions of infection. These results indicated that the parent W245 contributed valuable genes for both high yield and rust resistance. Some progenies were tested for seedling reaction to individual rust races and HD(52)–1 originating from the cross E558 x NP165 showed resistance to eight races of black rust and the subrace 42B; this strain was resistant to five races of brown rust and partly resistant to four other races. Strain HD(52)–30, selected from the cross W10 x NP710, was highly resistant to yellow rust in the adult stage and completely free of yellow rust in the seedling stage; this resistance came from W10 (Carsten's V x C518). Other strains were also resistant to several races of more than one species of rust. Three strains, including HD(52)–1, were highly resistant to loose smut. Resistance to lodging or drought was found in some of the strains. A number of the most promising selections are now undergoing regional tests.

1453 CHOUDHURI, H. C.
The inheritance of stem and leaf rust resistance in common wheat.
Indian J. Genet. 1958 : **18** : 90–115.

The inheritance of stem rust resistance in seedlings was studied in Thatcher x Mentana-Rhodesian, Thatcher x Kenya 360H and Selkirk x Mentana-Rhodesian. The F_3 segregation data indicated that both Mentana-Rhodesian and Kenya 360H carry two partially dominant genes, designated Sr_{13} and Sr_{14}, which condition a hypersensitive reaction to races 11 and 11–1. These varieties also carry four other partially dominant genes, Sr_{15} and Sr_{16} governing resistance to race 15B–3 and Sr_{17} and Sr_{18} for resistance to 15B–4; these two pairs of genes appear to act independently of each other. Mentana-Rhodesian and Kenya 360H seem to carry a gene, Sr_{19}, responsible for a hypersensitive reaction to races 15B–1 and 56; Sr_{19} is thought to be epistatic to Sr_{20} carried by Thatcher. The recessive gene Sr_{20} is responsible for resistance to race 56 but does not affect resistance to race 15B–1. Thatcher was also found to carry the genes Sr_{21} and Sr_{22} conditioning immunity to race 29–1 and it is probable that these genes also confer immunity to race 48–1.

Leaf-rust resistance was investigated in the cross Selkirk x Mentana-Rhodesian, tests being made with races UN5 (5a) and UN2 (15a). Selkirk was found to have a dominant gene Lr_{10} conferring resistance to these races; this gene is epistatic to a gene in Mentana-Rhodesian.

1454 GHOSH, S., SIKKA, S. M. & RAO, M. V.
Inheritance studies in wheat. IV.—Inheritance of rust resistance and other characters.
Indian J. Genet. 1958 : **18** : 142–62.

Field resistance to *Puccinia glumarum* was investigated in the crosses PbC281 x Cometa Klein and NP718 x Cometa Klein, and the F_1 and F_2 data indicated that the resistance of Cometa Klein is a dominant monofactorial character. Mature-plant resistance to *P. rubigo-vera* was found to be recessive and determined by a single pair of genes in a cross between the susceptible variety PbC591 and the resistant wheat Frontier. Susceptibility to *P. graminis* var. *tritici* was dominant in the cross NP790 (resistant) x NP775 (susceptible); the F_2 segregation of 13 susceptible: 3 resistant indicated that some factor, presumably from NP775, is inhibiting the resistance derived from NP790.

Early growth habit was studied in three crosses. F_1 plants of PbC281 (erect) x Cometa Klein (prostrate) and of NP718 (erect) x Cometa Klein were semispreading with a tendency towards the prostrate condition. The F_2 segregation ratio of 9 spreading : 6 semispreading : 1 erect indicated that two dominant cumulative genes interact to produce the spreading habit. The F_1 of NP790 (semispreading) x NP775 (erect) was semierect and the F_2 generation segregated into 3 erect or semierect: 1 semispreading; hence the two parents appear to differ by a single pair of genes for growth habit.

The F_1 generation of the cross NP790 (awnless) x NP775 (fully awned) was tipped, indicating that awnlessness is partially dominant over the fully awned condition. In the F_2 generation, awnless, short-tipped, long-tipped, half-bearded and fully bearded plants were found, there being a ratio of 15 (tipped and awnless): 1 fully bearded. This suggested that two duplicate dominant genes are responsible for awnlessness and the back cross results support this suggestion. Red grain colour was dominant to white in four crosses. NP790 was found to carry one dominant factor for grain colour, Cometa Klein two and Frontier three. In the cross PbC281 x Cometa Klein, awn colour appeared to be governed by two pairs of non-allelic genes, the black colour of PbC281 being dominant over the brown colour of Cometa Klein. The F_2 ratio of 12 black: 3 brown: 1 white suggested that the gene for black colour is epistatic to the gene for brown and that white-awned plants occur when genes for black and brown awns are not present in the dominant condition. F_2 segregation in the crosses NP718 x Cometa Klein and NP790 x NP775 indicated that the brown awned condition differs from the white awned by a single factor pair. Glume colour was investigated in the crosses PbC281 x Cometa Klein, NP718 x Cometa Klein and NP790 x NP775; the brown colour of Cometa Klein and NP790 was dominant over the white colour of the other varieties and it appeared to be a monogenic character. Glume hairiness was found to be dominant over the glabrous condition in the crosses PbC281 (thickly felted) x Cometa Klein (glabrous) and PbC591 (thickly felted) x Frontier (glabrous); the F_2 data suggest that a single pair of factors control glume pubescence.

None of the characters studied was linked with the field reaction to rusts and there was no correlation between grain colour and grain yield. In the crosses PbC281 x Cometa Klein and NP718 x Cometa Klein, there was a negative correlation between the number of days from sowing to earing and the yield of grain. Under Delhi conditions, the best yields are to be expected from varieties earing 100 days after sowing.

1455 Murty, G. S. & Lakhani, L. B.

Genetic studies in crosses between *aestivum* varieties and the *durum* wheat, Gaza.

Indian J. Genet. 1958 : **18** : 163–77.

The two crosses, *Triticum vulgare* 'NP710' x *T. durum* 'E931' (Gaza) and *T. vulgare* 'NP718' x Gaza, were studied. In F_1 progenies, the susceptibility of the *T. vulgare* parents to brown and black rusts was dominant; it appeared to be under the control of duplicate factors in each case and reaction to black rusts was inherited independently of that to brown rust. In respect of black rust, "resistant type" pustules were associated with a low degree of infection in mature plants but the "susceptible type" pustules occurred on plants which suffered various degrees of infection. F_3 segregation data from the cross NP710 x E931 indicated that the leaf hairiness of NP710 is a monogenic character dominant to the glabrous condition of the *T. durum* leaves. No association was found between leaf hairiness and rust reaction. The red grain colour of Gaza was dominant to the amber colour of NP710 and NP718 and is probably controlled by duplicate factors. All the parents were fully awned and had glabrous glumes but some F_2 and F_3 plants were awnless; others had partly developed awns and one had pubescent glumes. These results are attributed to some irregular behaviour of the chromosomes carrying the genes concerned. Some F_2 and F_3 segregates resembled the species *T. spelta*, *T. dicoccum*, *T. compactum* and *T. pyramidale.*

1456 Barnes, H. F., Miller, B. S. & Arnold, M. K.

The susceptibility of Atle wheat to attack by the wheat blossom midges.

Plant Path. 1959 : **8** : 143–44.

Mullin *et al.* reported that in the Irish Republic the spring wheat Atle displayed much more resistance to *Contarinia tritici* than Kärn II [Kernel II], Progress and Ella [cf. XXII, 2627]. Observations in 1958 at Harpenden and Cambridge, England, indicated that Atle was no less attractive to *C. tritici* and *Sitodiplosis mosellana* than Svenno and a number of other spring wheats.

1457 Cartwright, W. B., Caldwell, R. M. & Compton, L. E.

Responses of resistant and susceptible wheats to hessian fly attack.

Agron. J. 1959 : **51** : 529–31.

In susceptible varieties, larval infection causes stunting of the second and subsequent leaves, the larvae developing to maturity in a position 10 mm. above the fourth node. In infested resistant varieties slight stunting of only the second leaf occurs; the larvae die on the fourth or fifth day after hatching and are then carried up beyond the first leaf sheath. The moderately resistant variety W38 showed intermediate reactions.

1458 Priadcencu, A. & Melacrinos, A.
Încrucișarea îndepărtată—factor al evoluției organismelor (hibridul între *Aegilops* și grîu). [**Distant crossing, a factor in the evolution of organisms (the hybrid between *Aegilops* and wheat)**].
An. Romîno-Soviet. : Ser. Agric. 1957 : **11** : No. 2 : 55–80.

The first part of this article reviews the taxonomy of *Aegilops* and work on hybridizing *Aegilops* spp. with other species in the genus and in related genera. In Rumania, the following sterile hybrids have been obtained: *Ae. crassa* x rye, *Ae. ovata* x rye, *Ae. triuncialis* x rye, *Ae. cylindrica* x rye, *Ae. crassa* x wheat and the reciprocal, *Ae. triaristata* x wheat, and the reciprocal, wheat x *Ae. ovata*, wheat x *Ae. umbellulata*, wheat x *Ae. cylindrica* and wheat x *Ae. triuncialis*. Some back crosses have also been obtained.

A detailed description is given of a stable hybrid of (*Triticum vulgare* var. *erythrospermum* x *T. durum* 'Valencia') x *Aegilops ovata*, designated *Neo-Aegilotriticum*. It has $2n = 42$ chromosomes and a protein content in the grain of 16·45%.

1459 Melnyk, J. & Unrau, J.
Pairing between chromosomes of *Aegilops squarrosa* L. var. *typica* and *Secale cereale* L. var. Prolific.
Canad. J. Genet. Cyt. 1959 : **1** : No. 1 : 21–25.

With the aid of embryo culture, one hybrid was secured from *Ae. squarrosa* var. *typica* x *S. cereale* 'Prolific'. Because the chromosomes of rye are larger than those of *Ae. squarrosa*, it was possible to identify the parental chromosomes at metaphase I in the hybrid. The chromosomes of the two parents were capable of intergeneric pairing, 25% of the bivalents being rye-*Aegilops* associations. The gene on chromosome V (genome B) believed to be responsible for the cytologically diploid behaviour of hexaploid wheat [cf. XXIX, 1098, 1381] may also restrict pairing to completely homologous chromosomes in wheat x rye. Its absence in the *Aegilops* x rye hybrid allowed the pairing potentialities of homologous segments of chromosomes from the two genera to be freely expressed. By using monosomic V as the common-wheat parent, it may be possible to obtain genetic exchange between the chromosomes of wheat and rye.

1460 Chennaveeraiah, M. S. & Löve, Á.
Occurrence of supernumerary chromosomes and chromosome fragments in *Aegilops*.
Canad. J. Genet. Cyt. 1959 : **1** : No. 1 : 26–33.

Ae. columnaris ($2n = 28$) contained three pairs of satellited chromosomes, the satellites being more or less the same size. One of the eight plants examined had one or two supernumeraries. *Ae. cylindrica* ssp. *cylindrica* ($2n = 28$) normally has two pairs with small and a third pair with large satellites. One pair of satellited chromosomes was however heteromorphic in one preparation. One case of an extra short chromosome and two cells with 27 normal chromosomes and two fragments, probably telocentric, were noted. No fragments or supernumeraries were seen in *Ae. cylindica* var. *pauciaristata*. The possible mode of origin of the supernumeraries and fragments is considered. The possibility that they were induced by the 8-hydroxyquinoline pretreatment used in preparing the root tips cannot however be altogether disregarded.

BUCKWHEAT

1461 Žebrak, Ė. A.
(The photoperiodic reaction of tetraploid and diploid buckwheat).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **128** : 176–78. [Russian].

The tetraploid and diploid forms belonging to the western ecotype of *Fagopyrum esculentum* are long-day plants and a 9 hr. photoperiod checks the development of their vegetative organs, retards the onset of flowering and reduces fruit formation. The onset of flowering is more retarded in the diploid than the tetraploid. Diploid plants have a shorter period of fruit formation than the tetraploids. The latter are potentially more productive than diploids, provided they have an adequate supply of moisture and nutrients.

1462 RUSZKOWSKA, B.
Studia nad gryką. Cz. IV. Biologia kwitnienia. (**Studies on buckwheat. IV. Biology of flowering**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1958 : **2** : 391–401.

Data on the daily opening of flowers, the duration of individual flowers and the length of the total flowering period in Poland are given, varietal differences being noted.

OATS

1463 Haver, 1960. (**Oats, 1960**).
Landbouwvoorlichting **16** : Bijl. 57; Ber. Rassenkeuze 1959 : No. 274 : Pp. 5.

Yield data and notes are given for a total of 37 varieties tested on different soil types in the Netherlands. Eight of the 15 varieties undergoing preliminary trials have been retained for further testing.

1464 ATKINS, I. M., GARDENHIRE, J. H. & PORTER, K. B.
Oats for grain, winter pasture and other uses.
Bull. Tex. agric. Exp. Sta. 1959 : No. 929 : Pp. 20.

The wide diversity of climate in Texas has necessitated the division of the State into seven distinct regions. A number of oat varieties are assessed on the basis of yield, winter hardiness and disease resistance, and suitable varieties are recommended for each of the areas.

1465 KENT, N. L. & RODGER, J. B. A.
The yield and quality of oats in east-central Scotland trials, 1952–55.
Agric. Progr. 1958 : **33** : 96–103.

A report is given of tests of named varieties, with Sun II as control.

1466 FREY, K. J.
Yield components in oats. II. The effect of nitrogen fertilization.
Agron. J. 1959 : **51** : 605–08.

The results of this analysis of the N response of Marion, Clintland and Bond have already been reported elsewhere [1266].

1467 **New high-yielding oat released by Minnesota.**
Crops & Soils 1959 : **12** : No. 2 : p. 21.

Released by the Minnesota Agricultural Experiment Station, Minton is a yellow variety which has outyielded other varieties in eight localities in Minnesota. It heads four days later than Minhafer and two days before Ajax, maturing about the same time or later than Ajax. It has somewhat weaker straw than Minhafer and lower test weight and less resistance to smut and prevalent races of stem rust, except 7A, than other recommended varieties. It is relatively resistant to prevalent races of crown rust but is susceptible to races commonly found in south-eastern states.

1468 LAVROV, V.
(**A new oat variety, L'gov 1026**).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1959 : No. 1 : p. 48. [Russian].

The above cultivar was obtained by multiple hybridization involving Pobeda [Victory] and 125 at the L'gov Breeding Station. It is adapted to a range of climatic and soil conditions and outyields such varieties as Pobeda and Soviet by a considerable margin. It equals the last in drought resistance, does not lodge or shed and is fairly resistant to crown rust and loose smut, has large, white, awnless grain and a husk content not exceeding 27%. The straw is long and of a high forage value.

1469 FREY, K. J.
The relation between environmental and genetic variances for heading dates and plant heights in oats.
Agron. J. 1959 : **51** : 545–46.

In studies of 22 crosses, heritability percentages and genetic variances for heading date and plant height were significantly associated in all generations from the F_2 to the F_6. The correlation and exponential regression coefficients indicated that environmental and genetic variances were positively related for heading date but were independent for plant height. The rate of increase of the environmental variances for heading date in successive generations was lower than that for genetic variances. It is suggested that the environmental factor which most influences heading date interacts differently with the genotype from the main factor or factors influencing plant height.

1470 TOMS, W. J.
Avon—an oat variety resistant to manganese deficiency.
J. Agric. W. Aust. 1959 : **8** : p. 523.

Additional information is given concerning the resistance of Avon to Mn deficiency [cf. XXIX, 1439].

1471 FREY, K. J. & NORDEN, A. J.
Lodging resistance studies in oats. II. Inheritance and heritability.
Agron. J. 1959 : **51** : 535–37.

Data on the mean cL_r values [cf. XXV, 252] of the parents and F_2; F_3 and F_4 generations of 12 crosses indicated that in general the genes determining lodging resistance act additively in the F_3 and F_4. The mean standard unit heritabilities for cL_r were low, being 19, 6 and 15% respectively for the F_2–F_3, F_2–F_4 and F_3–F_4 comparisons. Within the variety Clintland there was considerable variability in lodging resistance and it is suggested that selection within this variety might be effective.

1472 Konzak, C. F.
Radiation-induced mutations for stem rust resistance in oats.
Agron. J. 1959 : **51** : 518–20.

The previously reported high proportion of resistant variants (XXV, 975) was found to result from natural hybridization, induced male sterility being a possible contributory factor towards out crossing. Of two further controlled experiments, each involving over 3000 X or neutron irradiated lines of Clintafe, one yielded five variants resistant to stem rust 7A and the other none. One of the variants (78–1) differed from the others in being distinctly more susceptible at 85° F. than at 70° F. Two of the mutants carried the gene *A* type of resistance and the remaining two segregated for both the *A* type and the 78–1 type.

1473 Simons, M. D.
Variability among strains of non-cultivated species of *Avena* for reaction to races of the crown rust fungus.
Phytopathology 1959 : **49** : 598–601.

Two hundred and sixteen strains representing all the major uncultivated oat species were tested for seedling reaction to 12 cultures of crown rust comprising a diversity of races. Eighty-seven of the strains were tested against each culture, and of these 37 showed some resistance to at least one culture and were found to represent 23 different patterns of reaction. One strain of *A. strigosa* and one of *A. abyssinica* were resistant to all 12 cultures and were also resistant to a large number of additional cultures. Several other strains of *A. strigosa* were resistant to most of the 12 cultures. A large group of diploid strains was susceptible to races 205, 232 and 235 but highly resistant to other races. A culture of race 264, which has a wide host range on cultivated varieties, did not differ significantly from other races in host range on the tested strains. Limited tests of pure lines selected from the original strains indicated that further types of resistance could probably be isolated without difficulty. Some strains with little or no seedling resistance had a high degree of field resistance.

1474 Browning, J. A. & Frey, K. J.
The inheritance of new sources of oat stem rust resistance.
Plant Dis. Reptr. 1959 : **43** : 768–71.

Eight strains of oats, CI 2413, 2710, 3030, 3031, 3037, 3038, 3039 and 3040, are resistant to race 6 of *Puccinia graminis*, most probably from a different source than from the *B* gene hitherto used in breeding for resistance. The reactions of crosses between CI 2710, 3030 and 3031 and Burnett, and between all eight lines and Markton suggest that the resistance of these lines is recessive and in CI 2710, 3030 and 3031 is conditioned by a single locus.

1475 Rivers, G. W.
Inheritance of resistance to *Helminthosporium* blight, crown rust race 216, and stem rust race 7A in oats.
Agron. J. 1959 : **51** : 601–03.

Inheritance of seedling resistance to *H. victoriae* and race 216 of *Puccinia coronata* var. *avenae* was studied in Minnesota selection II–47–4 [(Bond-Rainbow x Hajira-Joanette) x Landhafer] x Texas selection 145–44–43 [(Fulwin x Lee-Victoria) x (Red Rustproof^2 x Victoria-Richland)]. Resistance to *H. victoriae* depended on a single pair of recessive genes, while reaction to race 216 was also under the control of a single pair of genes, with susceptibility dominant. Some F_3 lines combined resistance to both pathogens. Studied in Bronco x Garry, resistance to race 7A of *P. graminis* var. *avenae* was inherited as a simple dominant.

1476 Coffman, F. A.
Black Mesdag, a possible parent for oat species crossing.
Plant Dis. Reptr. 1959 : **43** : 772–76.

Black Mesdag, which has never shown any resistance to stem or crown rust, has been crossed with the tetraploid Abd. 101 (*Avena abyssinica* 'CD4549' x *A. strigosa* 'CD3820'), which is highly resistant to many strains of both. A high degree of fertility was obtained in F_1, F_2 and F_3 generations. Segregation for crown-rust resistance was observed for races 263, 264, 274 and 294 and a fully fertile hexaploid line was obtained which is apparently homozygous for resistance to races 263, 274 and 294. No resistance to stem rust has been observed in any of the segregates.

1477 Krupka, L. R.
Metabolism of oats susceptible to *Helminthosporium victoriae* and victorin.
Phytopathology 1959 : **49** : 587–94.

Victorin, the toxin produced by *H. victoriae*, induced a marked increase in O_2 consumption in susceptible tissues compared with untreated resistant or susceptible controls; treated resistant material showed a slight depression in respiratory activity. The effects of various respiratory inhibitors on this reaction were studied and the possible metabolic pathways used during the increased respiration are discussed.

RYE

1478 Bose, S.
Aberrations in the nucleolar chromosome of inbred rye.
Diss. Lund Univ. 1958 : Pp. 7.

A summary is given of studies previously reported in a series of three papers [cf. XXVII, 1679, XXVIII, 1601 and XXIX, 1449].

1479 Price, S.
Chiasma terminalization in a structural heterozygote in *Secale.*
Genetics 1959 : **44** : 705–12.

Heterozygosity for an induced reciprocal translocation originating in a hybrid obtained by pollinating *S. cereale* with X-irradiated pollen of *S. montanum* resulted in metaphase I configurations which indicated that the point of translocation was so situated that chiasmata were formed both proximally and distally to it. Several configurations exhibited terminal multiple chiasmata. Such configurations refute the hypothesis that terminalization of chiasmata is arrested at points where homologies change. Furthermore, examination of the literature on other genera provides no conclusive evidence concerning the validity of this hypothesis.

1480 Lundqvist, A.
Studies on self-incompatibility in rye, *Secale cereale* L.
Diss. Lund Univ. 1958 : Pp. 10.

The results of a genetical analysis previously presented in a series of four papers are summarized. [Cf. XXVII, 1682, XXVIII, 1604, XXIX, 325 and 1450].

1481 Zaharov, G. A.
(A rye plant with a triple ear).
Priroda (Nature), Leningrad 1959 : No. 11 : 117–18. [Russian].

The above plant was found in a field of Vjatka rye in the Mari ASSR in 1956. The first ear bore 33 grains, the second 31 and the third 23, the respective weights of grain being 680, 660 and 470 mg. This teratological form is being studied at Mičurinsk.

MAIZE

1482 Cruz, D. L., Banaag, D. V., Seguerra, M. B. & Ricaforte, M. T.
Abstract bibliography of corn, 1946–1955.
Agricultural College, Laguna 1958 : Pp. 375 (Mimeographed).

This abstract bibliography is the first of a series dealing with maize. It contains 1568 entries, grouped under 24 subject headings which include breeding, genetics and hybrids.

1483 Turbin, N. V., Lobockaja, L. I. & Kunickij, E. A.
(The main results of the 1955–1956 experiments on testing varieties, lines and hybrids of maize as initial forms for breeding hybrid maize under the conditions of the White Russian SSR).
Uč. Zap. Belorussk. Un. (Sci. Mem. White Russ. Univ.) 1957 : No. 37 : 255–327 : from Ref. Ž. (Ref. J.) 1958 : No. 13 : Abst. 57193 : p. 31. [Russian].

Material characterized by high yield and thought to be of breeding value in White Russia is listed; it comprises a few early and midseason varieties, two intervarietal hybrids and three inbred lines.

1484 Hansen, H.
Forsøg med majssorter til grønhøstning. **(Trials of varieties of maize for green harvesting).**
Tidsskr. Planteavl 1959 : **63** : 448–69.

This is a fuller account, covering the years 1948–56, of work of which preliminary reports have already been abstracted [XXVI, 385 and XXVIII, 382].

1485 Savu, A.
Contribuţii la studiul soiurilor şi hibrizilor de porumb şi raionarea lor. **(Contributions to the study of varieties and hybrids of maize and their regional certification).**
Probl. Agric., Bucureşti 1958 : **10** : No. 4 : 52–58.

Tests of varieties and intervarietal hybrids at the Studina station, Rumania, during 1949–56 are reported. The best variety was Romînesc de Studina [Studina Rumanian] and this variety was also one of the best parents for the production of intervarietal hybrids.

1486 Baljura, V. I.
(Breeding maize in the Nonchernozem Zone).
Kukuruza (Maize) 1959 : No. 1 : 38–41. [Russian].

Breeding forage types adapted to the growing conditions in the above zone is discussed. The aim is to obtain varieties with a green-matter yield not appreciably below that of late ripening, leafy southern forms yet producing some milk-ripe grain. A number of varieties bred in recent years, Moscow 3, Moscow 5, Kazan' 108, Nemčinovka and IGAN1 [Genetics Institute of the Academy of Sciences 1], meet these requirements. Mention is made of inbreeding of early varieties from Siberia and the Agricultural Institute of the Nonchernozem Belt for use as maternal parents in the production of double and top crosses, the pollen parents being late leafy lines or hybrids from south Russia.

1487 Nelson, O. E.
Intracistron recombination in the Wx/wx region in maize.
Science 1959 : **130** : 794–95.

Five independently occurring waxy (*wx*) mutants produced *Wx* pollen grains in low frequencies ranging from 0·3 to 3·8 x 10^{-5}. *Wx* grains were distinguished by their black stain when treated with a KI + I_2 solution. The frequencies of *Wx* grains produced by hybrids between these mutants ranged from 1·4 to 88 x 10^{-5}, depending on the cross. On the basis of the data from the crosses, a linear order within the *Wx*/*wx* region could be established for the mutants. Functional complementation between the different mutants did not occur.

1488 Emmerling, M. H.
Further analysis of the R^{r} complex in *Zea mays*.
Genetics 1959 : **44** : p. 508. (Abst.).

In previous studies of the complex locus R^{r} [cf. XXIX, 3369], oblique crossing over was detected by means of the deficiency crossovers $^{(p)}(S)$ and $(P)^{(s)}$ but no evidence has yet been obtained establishing the occurrence of the duplication crossovers $(P)(P)(S)$ and $(P)(S)(S)$. It is possible to detect the $(P)(S)(S)$ crossover by means of alleles for aleurone colour, such as "*R* Stippled in compound with *R* Navajo-spot." The recombinant type $(S)(S)$ would be recognizable as a seed with both the stippled and Navajo-spot phenotypes. A fairly extensive test for recombination of these two *R* alleles was made with the cross "♀♀*gR*-Stippled *K*/*GR*-Navajo *k* x ♂♂$gr^{g}k/gr^{g}k$." Some seeds with both the stippled and Navajo-spot phenotypes were found among the 143,522 seeds examined. Cytological examination of these exceptional seeds showed them to be the result of chromosome aberration, none being caused by a cross-over gamete $(S)(S)$. On the basis of previous studies in which it was found that the rate of oblique crossing over was 1·3 x 10^{-4}, the expected number of $(S)(S)$ cross overs would be about 18. The difference between observed (0) and expected numbers of such crossovers was significant. Two explanations of the results are possible: (1) the action of *R* stippled and *R* Navajo-spot on seed and plant colour is not dependent upon structurally distinct genic components, or (2) the $(S)(S)$ crossover is not recognizable as stippled-Navajo spot seed when (S) components of homologous chromosomes are adjacent to each other on the same chromosome.

1489 van Schaik, N. W. & Brink, R. A.
Transpositions of modulator, a component of the variegated pericarp allele in maize.
Genetics 1959 : **44** : 725–38.

Of 87 independently occurring transpositions of modulator (*Mp*), a component of the allele for variegated pericarp at *P* on chromosome 1 [cf. XXIII, 1171], 56 were found to be positions linked with *P*. The closer the new site to *P*, the more likely was it to be occupied by transposed *Mp*. Evidence of transposition of *Mp* to chromosomes 2, 3, 4, 5 and 9 was also obtained. The frequency of secondary transposition varied widely from case to case. The data suggested that transposed *Mp* components situated close to *P* were less likely to alter their position in successive generations than those transposed further from *P*.

1490 Bauman, L. F.
Evidence of non-allelic gene interaction in determining yield, ear height, and kernel row number in corn.
Agron. J. 1959 : **51** : 531–34.

When two inbred lines and the single cross between them are crossed with an inbred tester, epistasis is indicated if the performance of the three-way cross differs significantly from the average of the two crosses of the inbreds with the tester. By this method, 34 sets of lines were tested, 18 for one year and 16 for two. Significant epistatic deviations were found in the individual years for each of the above characters, but the two-year results were nonsignificant when tested with the interaction epistasis x year as the error term. Significant epistasis x year interactions were given by five of the two-year sets for yield, by five for ear height and by eight for kernel-row number. In some sets in which the two lines were evaluated with two testers, significant tester interactions were found, showing that the tester genotype affects the detection of epistasis. The results suggest that epistasis is probably involved in determining the characters studied.

1491 Emmerling, M. H.
Preferential segregation of structurally modified chromosomes in maize.
Genetics 1959 : **44** : 625–45.

Abnormal chromosome 10 (K10) differs from its normal knobless homologue (k10) in the chromomere pattern of the distal region of the long arm and by the presence of an extra segment attached to the distal end of the long arm. The extra segment of chromatin consists of (1) a proximal euchromatic region, (2) a large heterochromatic segment and (3) a distal euchromatic region. In K10/k10 plants, K10 is known to segregate preferentially during megasporogenesis and to induce other chromosomes of the complement to segregate preferentially when one homologue is knobbed and the other knobless. The author has analysed two structurally modified types of K10 with respect to preferential segregation. The two types were: K°10, deficient for the entire knob and distal euchromatic region but possessing the chromomeres characteristic of K10, and K^S, lacking part of the knob and the distal euchromatic region. As indicated by means of marker locus *R*, K°10 underwent a reduced amount of preferential segregation in K°10/k10 heterozygotes, as compared with the value predicted for K10. In the presence of K10, K° showed a slight capacity for preferential segregation. As indicated by means of marker *Wd*, chromosome 9 (K^{L}9) with a large terminal knob on the end of the short arm underwent a low degree of preferential segregation in the presence of K°. The low amount of preferential segregation of K° suggests that the knob and distal euchromatic region play an important role in the manifestation of preferential segregation. An apparent reduction in the neocentric activity of K° may also be ascribed to the absence of the heterochromatic segment. In parallel tests of K^S, no evidence was obtained that it segregated preferentially in heterozygotes with k10, but the data were indicative of some preferential segregation in the presence of K10 and of such segregation by K^{L}9 in the presence of K^S. Cytological examination of K10/K10^S and K^S/k10 plants revealed the formation of neocentromeres by K^S. At present it is difficult to formulate a single hypothesis which would account for the contradictory results derived from K^S.

1492 Kikudome, G. Y.
Some aspects of the phenomenon of preferential segregation in maize.
Genetics 1959 : **44** : p. 520. (Abst.).

Kikudome, G. Y.
Studies on the phenomenon of preferential segregation in maize.
Genetics 1959 : **44** : 815–31.

The effect of knob size on the degree of preferential segregation was determined using stocks with knobs of different sizes on the short arm of chromosome 9. Chromosomes of each knob size were paired with knobless homologues and with homologues of different knob size, and the effect was determined by back-cross ratios of linked marker genes. The extent of preferential segregation and recombination was also determined in the long arm of chromosome 10 distal to the *r* locus.

The degree of preferential segregation of a knobbed over a knobless chromosome 9 was found to increase with increase in knob size. Some evidence was found of competition between knobs of different sizes when comparisons were made of segregation at the *wx* locus in large knob/medium knob and large knob/knobless heterozygotes. Preferential segregation was found to occur only in the presence of abnormal chromosome 10. While the incidence of crossing over in chromosome 9 is increased in the presence of "abnormal 10", the amount of increase is determined by the knob size of chromosome 9.

In the long arm of chromosome 10, crossing over between *r* and the distal marker sr_2 is reduced markedly in bivalents heterozygous for abnormality, no crossing over occurring in nonhomologous regions.

1493 Gardner, C. O. & Lonnquist, J. H.
Linkage and the degree of dominance of genes controlling quantitative characters in maize.
Agron. J. 1959 : **51** : 524–28.

In one sampling of the F$_2$ and F$_8$ of a cross between homozygous inbreds, dominance estimates for genes controlling yield were in the overdominance range in the F$_2$ and in the dominance range for the F$_8$. The degree of dominance and the dominance variance were

lower in the F_8 than the F_2 for every quantitative character, while consistently higher additive genetic variance was found in the F_8 than in the F_2. It is suggested that previous estimates of overdominance could have been due to upward bias as a result of repulsion-phase linkages among genes which are no more than partially or completely dominant, and that these linkages are broken in later generations of random mating [cf. XXIII, 2630].
In another sample, the F_2 and F_8 estimates were similar, both indicating a low degree of dominance. These could be accounted for by the exceptionally large amounts of additive genetic variance obtained for yield in both generations, and do not invalidate, although they do not support, the linkage-bias hypothesis. It is pointed out that the results, although indicating on the average only complete dominance of additive genes, do not preclude the possibility of overdominance at one or more loci.

1494 DYRDA, JA. F.
(Back-crossing—a reliable method of breeding hybrids).
Kukuruza (Maize) 1959 : No. 1 : 43–44. [Russian].

Work on the improvement of the early maize variety Minusinskaja Sibirjačka [Siberian maize from Minusinsk] at the Hakasskaja Agricultural Research Station, Siberia, is reported. The variety was first crossed with the taller and more productive variety Moldavian 2, the resulting F_1 hybrids being either back crossed to Moldavian 2 or crossed with Sterling, Perspektivnyj [Promising] or the hybrid Voronež. The F_1 from the initial cross resembled Minusinskaja Sibirjačka in earliness, but was taller and yielded more forage, the ears being higher above the ground. The back-cross hybrid yielded 95 c. per ha. more green matter than the F_1 hybrid and 32 c. more wax-ripe grain. The corresponding yield increases of the other F_2 hybrids amounted to 5–13 c. green matter and 16 c. grain.

1495 CERVATO, A. & GALLO, G.
Risultati di un biennio di sperimentazione sui mais ibridi nel Nicastrese. **(Results of two years' experiments with hybrid maize in the Nicastro district).**
Ann. Fac. Agr., Milano 1959 : **71** : 74–79.

Trials in 1957 and 1958 in the arid zone of Catanzaro in southern Italy showed greater variations in yield in the hybrids than in the local maize, which gave 17·76 and 17·26 c. per ha. of grains in the two years respectively. The only hybrid that exceeded the local maize in both years was Insubria 2201, with 18·03 c. in 1957 and 22·65 c. in 1958; U24 and Wisconsin 355 yielded well when supplies of manure and humidity were adequate.

1496 FENAROLI, L.
La produzione delle sementi ibride di mais in Italia con particolare riguardo all'esportazione. **(The production of hybrid maize seed in Italy with particular regard to export).**
Staz. sper. Maiscolt., Bergamo 1959 : No. 96 : Pp. 15.

Yields of over 100 c. of grain per ha. are attained in the Po valley, the maximum being 142 c. in Brescia; some 30% of the maize in Italy is now sown with hybrid seed and this has added 8½ million centners to the annual yield of grain. The conditions for seed production in Italy are favourable for developing an export trade and the hybrids that are available are listed according to their maturity class.

1497 VALEEV, Š. V.
(The hybridization of maize).
Kukuruza (Maize) 1959 : No. 1 : 41–43. [Russian].

An account of maize breeding at the Tartar Agricultural Research Station is given. The results include early flints and midseason dents adapted to Kazan' conditions. In recent years, intervarietal hybrids have been bred from the above forms, and these outyielded their parents and have been intermediate in earliness. Kazanskaja Skorospelaja [Early Kazan'] x Kazan' 1360 yielded the most grain, 51·3 c. per ha. More recently still, varieties bred at the above institute were crossed with line 21 from Černovcy or with single crosses from the Institute of Plant Industry [VIR]. All the resulting hybrids were more productive than the Kazan' varieties which were employed as ♀ parents, the increments in grain yield amounting to 8·0–24·6 c. per ha. The highest grain yield, 69·6 c. per ha., was recorded for the hybrid Kazan' 1037 x (VIR 17 x VIR 39).

1498 MUSIIKO [MUSIJKO], A. S. & KLIUCIKO, P. [KLJUČKO, P. F.]
Particularitățile hibrizilor de porumb obținuți prin încrucișarea soiurilor precoce cu cele tardive. **(The characteristics of maize hybrids obtained by crossing early varieties with late).**
An. Romîno-Soviet. : Ser. Agric. Zooteh. 1958 : **12** : No. 6 : 54–56.

[Cf. XXIX, 3787].

1499 Kolomiec, F. S.
(Kuban', a land of hybrid and varietal seed).
Kukuruza (Maize) 1959 : No. 2 : 7–9. [Russian].

The increase in maize seed production in the Kuban', including the seed of high yielding, double crosses bred at the Kuban' Branch of the Institute of Plant Industry, is discussed. The most productive double cross in 1958 was VIR 156 [Institute of Plant Industry 156], with a yield of 69·6 c. grain per ha. This was 3·4 c. per ha. more than the yield of VIR 42 which ripens 12–15 days earlier.

1500 Bockholt, A. J., Rogers, J. S. & Collier, J. W.
Corn hybrids for Texas.
Bull. Tex. agric. Exp. Sta. 1957 : No. 878 : Pp. 12.

Data are provided on the average performance of hybrids and varieties tested in different areas of Texas during the three-year period 1954–56. The nine hybrids recommended are described. They include four yellow hybrids, Texas 32, 34, 36 and 38, and a white hybrid, Texas 17W, which were released during this period. These newer hybrids are better adapted for specific conditions than the older hybrids.

1501 Giosan, N., Mureşan, T. & Voinea, R.
Hibrizi dubli de porumb de perspectivă în R.P.R. (**Promising double hybrids of maize in the Rumanian People's Republic**).
Probl. Agric., Bucureşti 1958 : **10** : No. 4 : 7–20.

Data on maturation period and yield for a series of double hybrids, mainly American and Russian introductions, for a number of Rumanian localities during 1956 are provided. In the most favourable areas, Pioneer 345 performed best.

1502 **Corn hybrids and varieties, 1958 tests in Mississippi.**
Bull. Miss. agric. Exp. Sta. 1959 : No. 574 : Pp. 8.

Information is given on the performance of named and experimental hybrids in north, central and south Mississippi.

1503 Galeev, G. S.
(Sterile forms of hybrids).
Kukuruza (Maize) 1959 : No. 2 : 38–42. [Russian].

This account of breeding maize at Krasnodar deals with the development of male-sterile and pollen-restoring lines in respect of the Moldavian and Texan types of sterility [cf. XXVIII, 2919]. It was found that only one kind of sterility could be transferred to some Soviet lines, for instance the Moldavian type to lines VIR 44 and VIR 115 and the Texan type to VIR 20 and VIR 26. The high-yielding double crosses VIR 42, VIR 313, VIR 327 and VIR 344 are derived from the pollen-sterile analogue of line VIR 44. The production of most of the hybrids has been retarded by the shortage of pollen-restoring lines, particularly for hybrids possessing the Texan type of sterility; the lines of this kind in the collection of the Institute of Plant Industry are listed.

1504 Jugenheimer, R. W.
High-oil hybrids make King Corn more useful.
Ill. Res. 1959 : **1** : No. 1 : p. 7.

The new hybrids Ill. 6021 and Ill. 6052 yield 25% more oil and 10% more protein than present commercial hybrids. They are adapted in maturity to the southern three-quarters of Illinois.

1505 Manoliu, M., Covor, A. & Popovici, V. V.
Producerea seminţei de porumb dublu hibrid (I). (**The production of double-hybrid maize seed. I.**)
Probl. Agric., Bucureşti 1958 : **10** : No. 3 : 13–23.

Manoliu, M. & Covor, A.
Producerea seminţei de porumb dublu hibrid (II). (**The Production of double-hybrid maize seed. II.**)
Ibid. 1958 : **10** : No. 4 : 35–45.

The technique of seed production of double hybrids between inbred lines as practised in Rumania is described. Reference is also made to the possible value of supplementary pollination and to the potentialities of Rumanian maize populations as sources of inbred lines.

1506 Vahtin, Ju. B.
(The question of the different extent of heterozygosis in maize within an open pollinated variety).
Bjull. Inst. Biol. Akad. Nauk Belorussk. SSR (Bull. Inst. Biol. Acad. Sci. White Russ. SSR) 1956 (1957) : No. 2 : 196–98 : from Ref. Ž. (Ref. J.) 1958 : No. 13 : Abst. 57194 : p. 31. [Russian].

In several maize varieties some first-generation inbreds displayed greater uniformity in plant height and height of ear attachment than others. This is ascribed to differences in the degree of heterozygosity in different plants within an open-pollinated variety.

1507 Adams, M. W. & Shank, D. B.
The relationship of heterozygosity to homeostasis in maize hybrids.
Genetics 1959 : **44** : 777–86.

A detailed report is given of an analysis, the main results of which have already been summarized [cf. 1200].

1508 Santos, I. S., Bernardo, F. A. & Marcos-Tepora, N.
Performance of yellow-endosperm synthetic corn varieties.
Philipp. Agric. 1959 : **43** : 260–70.

Inbreds known to have high combining ability in double crosses were combined into nine synthetics of four, six, seven and eight lines. Some of the inbreds had been extracted from College Yellow Flint and Cuban Yellow Flint while others had been obtained from the USA and Colombia. The synthetics were subjected to (1) two dry-season tests and (2) one wet-season test at College, Laguna, Philippines. None was significantly higher in yield than College Yellow Flint in (2) but in (1) two (Syn. i_1 and Syn. h_1) outyielded this variety and equalled the recommended double cross Phil. Hybrid 1d. These two synthetics were respectively derived from four and six lines; all the other synthetics originated from seven or eight lines. First and second-generation synthetics did not differ significantly in yield.

1509 Kolesnikov, S. M.
(The question of the nature of heterosis in interline maize hybrids).
Uč. Zap. kišenev. Univ. (Sci. Mem. Kišinev Univ.) 1957 : **28** : 111–22 : from Ref. Ž. (Ref. J.) 1958 : No. 13 : Abst. 57196 : p. 31. [Russian].

[Cf. XXIX, 1491].

1510 Rama Dayal Singh
Evaluation of second cycle inbreds of maize by different types of related and unrelated testers.
Indian J. Genet. 1958 : **18** : 199–205.

Twenty S_6 second cycle inbreds developed by inbreeding and selection in the cross Ohio M15, (Oh51 x Oh26) x (IllA x W23) were each crossed to 10 testers, seven of which were related to the S_6 lines. Little correlation was found between inbred testers in their ability to evaluate the lines for yield in a similar order; this may be due to differences in the specific combining ability of the testers with the tested lines. With one exception, yields obtained with inbred testers were significantly correlated with yields of single-cross testers, in which the inbred tester was one of the parents; the correlations for inbred testers and double-cross testers were on the whole not significant. In all cases except one, there was no association among single-cross testers in their ability to evaluate for yield and in most cases single-cross testers did not show any rank association with the double-cross testers; correlation between a parental and a nonparental double-cross tester was significant but rather low. These results indicate that more than one single or double cross should be used in evaluating inbred lines for general combining ability. A correlation coefficient of ·783 for the yield means of the four parental inbred testers with the means of the two related single crosses suggests that either four inbreds or their two single crosses may be used in evaluating lines for yield. With regard to stalk lodging and root lodging, it was found that four inbred testers, their two single crosses or the double cross of the four inbreds could be used to determine general combining ability. Correlations among testers for evaluating maturity were generally high, indicating that fewer testers would be needed to evaluate this character. High correlation between the average performance of all related testers and the average of all unrelated testers showed that each group provides valid information on general combining ability for yield, maturity and stalk lodging resistance.

1511 Ting, Y. C.
Meiosis in triploid maize-teosinte hybrids.
Genetics 1959 : **44** : p. 542. (Abst.).

In a population of 22 plants from the back cross (Huixta teosinte x Wilbur's flint) x Wilbur's flint, two plants were triploids. The high frequency of triploids is attributed to nuclear disturbance following hybridization between the two genera. Production of unreduced egg cells is regarded as the most probable mode of origin of the triploids. Pachytene associations appeared to be 2-by-2 instead of 3-by-3. At diacinesis, univalents averaged 1·5, bivalents 1·2 and trivalents 8·6 per sporocyte. In spite of laggards at meiosis I and II, micronuclei were only occasionally formed at the quartet stage.

1512 Maguire, M. P.
A study of homology between a terminal portion of Zea chromosome 2 and a chromosome segment derived from Tripsacum.
Genetics 1959 : **44** : 524–25. (Abst.).

In the course of a study of hyperploid maize carrying chromosomes derived from *T. dactyloides*, a $2n + 1$ stock was isolated containing a pair of maize-*Tripsacum* interchange chromosomes. One of the chromosomes carried a terminal portion of maize chromosome 2 attached to a segment of a *Tripsacum* chromosome bearing no apparent homology to any maize chromosome. The reciprocal exchange contained the remainder of chromosome 2, including its centromere, and a portion of the *Tripsacum* chromosome marked by a terminal knob equal in length to the distal segment of maize chromosome 2 for which it had been exchanged. The last-mentioned *Tripsacum* segment carried *Lg* and *Gl* genes capable of dominating lg_1 and gl_2 in chromosome 2 of maize. At pachytene in disomic plants containing one normal maize chromosome 2 and one exchange maize-*Tripsacum* chromosome 2, the corresponding segments from the two genera were commonly paired throughout, although failure in pairing, usually terminal, occurred with varying frequency and to a variable extent in this region. A similar failure in pairing was observed to a lesser degree in bivalents of each of the other chromosomes at pachytene. The distribution, frequencies and extent of these failures were studied and certain correlations noted, such as a direct relationship between relative chromosome length and frequency of failure. The bearing of these findings upon concepts of chromosome homology and synapsis received attention.

1513 Lebedeva, Z. V.

(The effect of supplementary pollination with foreign pollen on the depressive action of inbreeding in maize).

Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **126** : 1096–99. [Russian].

Further information to the previous report is presented [cf. XXIX, 2601]. It consists of descriptions of the F_1 of the plants in the original experiments, and a table showing the periods from emergence of shoots to flowering, plant height, length and weight of ear, number of grains per ear, percentage seed viability and rate of germination. It is concluded that fertilization with self pollen + pollen of rye, hemp, pumpkin or sunflower reduced the depressive effects of selfing in the F_1. Improvements in vitality, by comparison with the progeny from normal selfing, were also observed, though they were less noticeable in the progenies (*a*) from self pollen + sterilized pollen of another species and (*b*) after the flowers had been treated with α-naphthylacetic acid previous to selfing. All the treated selfed lines were found to be more uniform morphologically than the corresponding normal selfed lines.

1514 Coe, E. H.

Time of the regular conversion-type event at the *B* locus in maize.

Genetics 1959 : **44** : p. 504. (Abst.).

Earlier experiments revealed that B' regularly causes B to change to B' but that b is unaffected by B' [cf. XXIX, 3812]. "A mutable allele at the B locus, B^v, simulates b, but mutates frequently to B expression. When B^v is confronted with B' the B-like capacity of B^v is unaffected: heterozygous plants have intense sectors.—Either B^v and its B mutants are intractable, or conversion occurs at or near meiosis and B' suppresses B action throughout the life cycle (but only when the two are together from the time of fertilization). Results of irradiation experiments also have a bearing on the time of the conversion-type event."

1515 Spasojević, V.

Mutanta *rt* kod kukuruza. **(Mutant gene *rt* in maize).**

Arh. poljopr. Nauk. 1959 : **12** : No. 35 : 35–51.

A new deleterious mutation of maize which is responsible for reduction of the internodes, leaves and stamens is reported from Belgrade. The mutation is controlled by a single recessive gene *rt*, probably located in the third linkage group. Plants carrying *rt* in the homozygous state have greatly reduced vitality and fertility and seed of a low viability. The *rt* gene acts at an early stage of embryogenesis but discontinuously so that its expression is chimeral. Two putative explanations of the action of *rt* are put forward: (1) it inhibits mitotic activity of the meristems; and (2) it checks the synthesis of some growth substance which stimulates mitotic activity.

1516 Ashman, R. B.

Modification of expression and mutability of stippled aleurone (R^{st}) in maize.

Diss. Abstr. 1959 : **19** : LC Card Mic 59–1161 : p. 2720. (Abst.).

Previous investigations have shown that the action of R^r (self-coloured aleurone) in the progeny of $R^r R^{st}$ (heterozygous stippled) plants is markedly reduced [cf. XXIX, 944]. Attention has therefore been directed to the nature of R^{st} and of a variant phenotype termed light stippled (R^{lst}). R^{lst} has been found to differ from R^{st} only as regards a modifier situated 5·7 cross-over units distal to locus R. The modifier affected the frequency of coloured spots in the aleurone, $R^{st}r^{r}r^{r}$ endosperms averaging 20·3 and $R^{lst}r^{r}r^{r}$ endosperms 1·8 spots per 5 mm.^{2}. R^{st} and R^{lst} in homozygotes mutated to self colour (R^{sc}) at the respective rates of 17·0 and 19·9/10^{4} gametes tested. When R^{st} and R^{lst} were heterozygous with r^{r} (colourless aleurone), they mutated to R^{sc} at the respective rates of 4·9 and 4·3/10^{4} gametes. The basis of the difference in the mutation rate of R^{st} and R^{lst} in homozygotes and heterozygotes with r^{r} is unknown. Since several somatic mutations of R^{st} to R^{sc} were detected, alterations to R^{sc} are probably not associated with crossing over. When homozygous, R^{lst} mutated to colourless or nearly colourless aleurone at the rate of 0·4/10^{4} gametes. When homozygous, R^{st} did not undergo this type of mutation. Mutations to colourless or nearly colourless aleurone occurred in both $R^{r}R^{st}$ and $R^{r}R^{lst}$ heterozygotes. The effect of homozygosity and heterozygosity upon the frequency of mutation of R^{r}, R^{st} or R^{lst} to colourless or nearly colourless aleurone remains unknown. Two processes may be involved: (1) allelic interaction and (2) unequal pairing and crossing over. R^{lst} proved similar to R^{st} in its effect on the pigment-producing action of R^{r} in the progeny of $R^{r}R^{lst}$ plants. A test was made to determine whether mutations of R^{st} and R^{lst} to R^{st} were associated with transpositions of a genetic component from locus R. The test gave a negative result but did not exclude the possibility that transpositions to sites close to R may have occurred or that a transposed component had no observable effect on the expression of R^{st}.

1517 Sagajdak, I. N. & Krasnopol'skaja, T. G.
(Vegetative graft hybridization).
Kukuruza (Maize) 1959 : No. 2 : 42–43. [Russian].

A new grafting technique for maize has been developed at Odessa. Two plants are taken at the first leaf stage. One of them is decapitated just below the first node and the cut surface is inserted into a slit made below the node of the other plant. The result is a plant with two stems below the first node, two endosperms and two root systems. Many grafts involving 13 different varieties were made in this way. The grafted plants showed morphological changes, especially in the shape of leaves and tassels and the selfed ears bore grains with hybrid characteristics.

1518 **Michigan 300 corn.**
Crops & Soils 1959 : **12** : No. 1 : p. 21.

Michigan 300, with a maturity period of 90 days, is recommended for general use in the north-central part of Michigan and may be grown in the south-central part where an early variety is required or planting is late. This new hybrid outyields Michigan 350; its husks are loose and it has a high shelling percentage. When the plants are mature the grain dries out rapidly in the field.

1519 **New early corn for northern areas.**
Crops & Soils 1959 : **12** : No. 2 : 20–21.

AES202 is an early-maturing hybrid developed for areas with a short season such as the Upper Peninsula of Michigan; it is recommended for grain production and has outyielded other hybrids adapted to these regions.

1520 Bianchi, A.
A new type of chromosome 7 in Italian maize.
Genetics 1959 : **44** : p. 500. (Abst.).

A region on the long arm of chromosome 7, staining deeply with acetocarmine and adjacent to the centromere, is characteristic of American maize. Examination of over 200 samples from all over Italy showed that about three-quarters of them were without the deeply staining region. Possibly its absence in most samples is a reflection of the scarcity of heteropycnotic material typical in Italian maize. In about 10% of the plants, the large knob characteristic of the long arm was replaced by a small knob in close proximity to a prominent chromomere. No conclusions have been reached concerning the mode of origin of these two bodies.

1521 Sinha, S. K.
Biochemical studies on the action of a gene controlling meiosis in maize.
Science 1959 : **130** : p. 1425. (Abst.).

When homozygous, the recessive gene ameiotic (*am*) completely suppresses meiosis in both the ♀ and ♂ sporocytes, meiosis being replaced by a type of mitosis. Paper-chromatographic analysis showed that normal and *amam* plants did not differ in free aminoacids and sugars, but that in aqueous or alcoholic extracts of various organs of *amam* plants a compound was present which gave yellow fluorescence in ultraviolet light and which was almost absent in normal plants. Analyses of precursors of nucleic acids, nucleic acids and histones in root tips and young ears gave the following results. (1) In *amam* plants certain acid-soluble precursors accumulated which were probably not incorporated into nucleic acids as rapidly as in normal plants. (2) Ameiotic plants and normal sibs did not differ in quantity of DNA or total nucleic acids, but the amount of RNA relative to DNA was greater in *amam* than in normal plants. Differences were also detected in (3) the apurinic DNA fraction after hydrolysis with dilute HCl and (4) the amount of histones relative to DNA. Probably, therefore, onset of meiosis and its normal progress depend upon a critical balance between the two nucleic acids and between DNA and histones.

1522 Ma, T.-H.
Cytogenetic studies of gamma radiation of maize.
Genetics 1959 : **44** : 523–24. (Abst.).

The following four stages were chosen for studying the genetic effects of γ radiation: premeiosis, meiosis, pollen mitosis and pollen maturity. Dominant testers were exposed to 1100 r. from a Co^{60} source over a period of $23\frac{1}{2}$ hr. Chromosome aberrations were determined in material fixed immediately after treatment and in F$_1$ plants. The mutations investigated were confined to endosperm characters, including aleurone colour, the dominant testers being used as pollinators of untreated recessive testers. Pollen mitosis proved to be the most effective stage for inducing aberrations and mutations. A high frequency of fragment-free bridges was scored in F$_1$ plants. Heterofertilization played an important part in the genetic events. Restitution and rejoining of broken chromosomes and elimination of fragments were evident.

1523 Latterell, R. L.
Changes in radiosensitivity of maize chromosomes during seed germination.
Genetics 1959 : **44** : 521–22. (Abst.).

Seeds heterozygous for alleles at locus Yg_2 were exposed to 800 r. of X rays after being soaked at 27° C. for periods up to 36 hr. Somatic sectors, representing losses of the dominant allele, provided a criterion of chromosome breakage. Radiosensitivity, as indicated by sector frequency, increased gradually during the first 16 hours of germination and then increased abruptly from 16 to 22 hr., after which a plateau was reached. Rate of oxygen uptake by untreated soaked seeds increased steadily throughout a 36 hr. period of germination.

Dry and soaked seeds were irradiated in air or helium. The presence or absence of oxygen during irradiation of dry seeds had no influence on the frequency of somatic sectors. Sector frequencies were markedly reduced when seeds soaked for 6 hr. or longer were irradiated in helium. The oxygen effect reached its maximum at about 6 hr. after the beginning of soaking and decreased with longer periods of germination. These findings suggested that the abrupt rise in radiosensitivity with 16–22 hr. of germination was related to metabolic changes and essentially independent of the effect of oxygen in enhancing breakage frequency.

1524 Chao, C. Y.
Heterotic effects of a chromosomal segment in maize.
Genetics 1959 : **44** : 657–77.

A detailed account is given of investigations which have already been briefly reported [XXVIII, 4153].

1525 Doyle, G. G.
Preferential pairing in trisomic, triploid and tetraploid inversion heterozygotes of *Zea mays*.
Science 1959 : **130** : p. 1415. (Abst.).

The inversion studied was a paracentric one involving more than half of the long arm of chromosome 3. Evidence of preferential pairing was obtained from (1) back-cross ratios for locus *A* in the inversion and (2) a comparison of the frequencies of chromatid bridges in tetraploids having a single inverted chromosome with those in tetraploids possessing two inverted and two normal chromosomes 3.

1526 Kedrova-Zihman, L. V. & Bormotov, V. E.
(Intensity of respiration of maize ovaries under different conditions of crossing).
Bjull. Inst. Biol. Akad. Nauk Belorussk. SSR (Bull. Inst. Biol. Acad. Sci. White Russ. SSR) 1956 (1957) : No. 2 : 222–27 from Ref. Ž. (Ref. J.) 1958 : No. **13** : Abst. 57189 : p. 30. [Russian].

Rate of respiration in five-day-old ovaries of maize subjected to various pollination treatments was studied. The highest rate of respiration was observed in ovaries subjected to interline pollination; the rate of respiration in ovaries subjected to self pollination was higher than in those subjected to intravarietal or intervarietal pollination.

1527 Mohamed, A. H.
Inheritance of quantitative characters in *Zea mays*. I. Estimation of the number of genes controlling the time of maturing.
Genetics 1959 : **44** : 713–24.

Inheritance of time of maturity was determined in a cross between inbreds EG102 and EG205 at the Department of Genetics, Alexandria. Numbers of days from (1) sowing to silking and (2) sowing to pollen shedding were controlled by three and two major gene pairs respectively, as indicated by means of the partitioning method devised by Powers [XIII, 629] and Powers *et al.* [XXI, 2239]. Differences in number of days between silking and pollen shedding were governed by one pair of major genes. Complete phenotypic and genic dominance was found for fewer days from sowing to silking and from sowing to pollen shedding and for longer duration of the period between silking and pollen shedding.

1528 KEDROVA-ZIHMAN, L. V. & BORMOTOV, V. E.
(The duration and intensity of flowering of selfed lines of maize and their parental forms).
Bjull. Inst. Biol. Akad. Nauk Belorussk. SSR (Bull. Inst. Biol. Acad. Sci. White Russ. SSR) 1956 (1957) : No. 2 : 192–95 : from Ref. Ž. (Ref. J) 1958 : No. 13 : Abst. 57195 : p. 31. [Russian].

Inbred lines flowered for a shorter period than the initial variety, while lines derived from top crosses or double crosses had either the same or a longer flowering period than the initial material.

1529 VETTEL, F. K. & WALTHER, F.
Der Einfluss von höheren Temperaturen im Keim- bzw. Jungpflanzenstadium auf die Entwicklung des Maises (*Zea mays* L.). **[The influence of raised temperatures at the seedling and young-plant stage on the development of maize (*Z. mays* L.)].**
Z. Pflanzenz. 1959 : **41** : 326–42.

Development was accelerated in four varieties after the seedlings had been kept at temperatures of 30–36° C. for nine to 10 days. By this treatment late varieties can be induced to flower at the same time as earlier ones so that crosses may be effected between the two types. Also this treatment makes it possible to obtain seed from late varieties which do not normally ripen in Germany.

1530 MANOLIU, M. & CRĂCIUN, T.
Observaţii asupra fenomenului de xenie la porumb. **(Observations on the phenomenon of xenia in maize).**
Probl. Agric., Bucureşti 1958 : **10** : No. 1 : 25–33.

Experiments on pollination with pollen mixtures are reported. Evidence was obtained of selective fertilization in the F_0 and of the appearance of characters derived from more than one pollen parent in the F_1.

1531 BUCHERT, J. G.
The effect of critical time and location of gene action on the degree of pollen abortion and the inheritance pattern in the restoration of cytoplasmic male sterility in maize.
Genetics 1959 : **44** : p. 501. (Abst.).

Cases of departures from the Mendelian inheritance of the *Rf* genes which suppress the cytoplasmic component, [*ms*], for ♂ sterility were investigated. All crosses or selfings of the type $[ms_2]$ x $[ms_2]Rf^2rf^2$ yielded only fertile progeny, whereas those of the type $[ms_2]Rf^2rf^2$ x rf^2rf^2 gave rise to progeny segregating for fertility. "Thus, when with $[ms_2]$, Rf^2 was selected for in the pollen. When the inheritance of Rf^2 was checked in plants not having $[ms_2]$, no such selection occurred." Selection for Rf^2 and consequently the pattern of inheritance depended, therefore, on an interaction between $[ms_2]$ and Rf^2 in the presence of the residual genotype (A158, M14 and P39). Degree of pollen abortion also depended on the interaction. In contrast to cases of normal segregation, $[ms_2]Rf^2Rf^2$ plants had as high a percentage of normal pollen as the corresponding inbred, but $[ms_2]Rf^2rf^2$ plants produced pollen of which 50% aborted. The following conclusions were reached. (1) The primary diffusible gene product was synthesized in the gametophyte, shortly after cross-wall formation during microsporogenesis, the restoration process being accomplished shortly afterwards. (2) The critical stage determining pollen abortion occurred after microsporogenesis. (3) "A small particle-number hypothesis cannot account for the results." (4) The tapetum played no role in abortion.

1532 DUVICK, D. N.
A new fertility restorer genotype in cytoplasmic male-sterile maize.
Genetics 1959 : **44** : p. 508. (Abst.).

When crossed with the ♂-sterile line $WF9^T$, three progenies from the S_1 of the back cross WF9 x ($WF9^T$ x KY21) gave rise to all ♂-sterile progeny, whereas when crossed with the ♂-sterile $SK2^T$ they produced all ♂-fertile progeny. This confirms the author's hypothesis [cf. XXVII, 1738] that fertility restoration of T cytoplasm depends upon the simultaneous presence of at least two dominant genes, either of which, if present as a homozygous recessive, can cause sterility. The genotypes of the lines referred to are thus presumed to be: SK2, $rf_1rf_1Rf_2Rf_2$; WF9, $rf_1rf_1rf_2rf_2$; KY21, $Rf_1Rf_1Rf_2Rf_2$; and the selected S_1 line $Rf_1Rf_1rf_2rf_2$. The genotype of WF9 with respect to fertility restoration appears to be unique among Corn Belt inbreds, since among 90 nonrestorer lines, only WF9 and possibly two lines derived from hybrids involving WF9 were found to be recessive for two major restorer genes. All other lines were recessive for a single major gene and, in all cases in which test crosses were made, this gene was rf_1. So far no inbreds, other than the above-mentioned S_1 selection, were found to carry $Rf_1Rf_1rf_2rf_2$. Ways in which this new genotype can be used to produce restored hybrids without detasseling have received attention.

1533 USTINOVA, E. I.
(A study of male sterility in maize).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **127** : 689–92. [Russian].

The nature of male sterility in inbred lines 44, 64 and a partially male-sterile form of the hybrid Slava [Glory] was studied in Moscow. Cytological investigation showed that (1) meiosis in all the above material was normal and the nuclei functioned regularly during tetrad formation and (2) the pollen grains of the sterile forms had, by comparison with ordinary male-fertile plants, only small amounts of starch, ascorbic acid, aminoacids, heteroauxin and fats which accounted for the degeneration of cytoplasm in the male-sterile material during the formation of the male gametophyte. It is concluded that degeneration of cytoplasm is responsible for the sterility of the pollen. The percentage of fertile pollen in the partially male-sterile Slava was 26·4% and in the inbreds 44 and 64, 0·7 and 0·9% respectively.

1534 MIKENAS, G. S.
(Nitrogenous substances in the grain of inbred hybrid families of maize and their parental forms).
Izv. moldav. Fil. Akad. Nauk SSR (News Moldav. Branch Acad. Sci. SSR) 1957 : No. 1 : 17–30 : from Ref. Ž. (Ref. J.) 1958 : No. 13 : Abst. 57190 : p. 30. [Russian].

Differences between hybrids and parents in the content of total nitrogen and of various nitrogen compounds were investigated. Greater differences were observed in the content of aminoacids than of protein.

1535 GRINFEL'D, Ė. G.
(Some questions of biology of flowering in maize).
Agrobiologija (Agrobiology) 1959 : No. 1 : 86–90. [Russian].

The following aspects of flowering of the standard variety North Dakota were studied at Stalingrad: (1) time of flowering during the day, depending on air temperatures; (2) length of the period of flowering of the ♂ inflorescences and the mean number of flowers in an inflorescence depending on the density of planting; (3) receptivity of the stigmas from the first to eleventh day of flowering, and (4) viability of the pollen.

1536 WANG, M.-H., SU, C.-L. & CHEN, W.-C.
(Biological investigations into the viability of maize pollen, the receptivity of the stigmas and flowering).
Nung-yeh-hsueh Pao (J. Agric.)/Act. Agric. sin. 1959 : **10** : 121–28. [Chinese].

The floral biology of maize under Chinese conditions was investigated. The fertilization capacity of the pollen drops considerably after 8 hr. and is negligible after 24 hr. The silks are fully receptive for the first 5 days; after 9 days receptivity is very reduced.

1537 KOVÁCS, I.
A kukorica hidegtűrőképességének fokozása, különös tekintettel a koraiságra, a termés nagyságára és biztonságára.
(Increasing the cold tolerance of maize, with special reference to earliness and to size and reliability of yield).
Magyar tud. Akad. Agrártud. Oszt. Közl. 1959 : **16** : 138–41.

Testing and selection for cold tolerance have been carried out in inbred lines, and some hybrids and varieties have also been tested; good agreement was found between laboratory and field tests. When obtained from parental lines developed under cold conditions, the hybrid Martonvásár 5 germinated earlier and better, was more uniform in growth and yielded 10% more than the same hybrid from untreated parents.

1538 NELSON, R. R.
Genetics of *Cochliobolus heterostrophus*. III. Genetic factors inhibiting ascus formation.
Mycologia 1959 : **51** : 132–37.

From a cross of a wild-type conidial strain with an isolate carrying factors for ascus abortion, a monoascosporic isolate (S3) was obtained which produced sterile perithecia on selfing; most of the sterile perithecia differed from normal perithecia in having a shorter, poorly developed beak. S3 was found to be homocaryotic. No fertile crosses have been obtained between S3 and the wild type but some perithecia of normal appearance and a few immature asci were obtained indicating the occurrence of some interaction between the strains. The isolate S3 appears to be capable of functioning either as the *A* or *a* mating type to a certain extent. It is suggested that the mechanisms governing the formation of sterile perithecia and sterile asci have one or more genes in common. Also the ability to produce sterile perithecia in selfed cultures may be a step in a transition from heterothallism to homothallism. [Cf. 378–9].

1539 van Schaik, T. & le Roux, P. M.
Genetic nature of some sources of resistance to leaf blight in maize caused by *Helminthosporium turcicum*.
S. Afr. J. agric. Sci. 1959 : **2** : 255–59.

Nine resistant varieties were crossed with the highly susceptible variety K64, and the hybrids back crossed to both parents. Among the back crosses to the susceptible parent, the Mexican varieties Mex 155, Mex 185 and Mex 82 produced nearly equal numbers of resistant and susceptible plants. This was attributed to a single dominant gene.

Crossing Mex 155 with a number of other varieties showed that the gene conferring resistance in this variety is completely dominant. Variation in grades of susceptibility among the nonresistant Mex 155 segregates is attributed to modifying genes.

1540 Dickson, J. G., Syamananda, R. & Flangas, A. L.
The genetic approach to the physiology of parasitism of the corn rust pathogens.
Amer. J. Bot. 1959 : **46** : 614–20.

Investigations were carried out on the effects of temperature and carbohydrate source on the reaction of maize to *Puccinia sorghi* and on the significance of oxygen uptake in relation to types of reaction to this pathogen. Using one inbred of maize as host genotype and several lines of the fungus, each heterozygous or homozygous for genes involved in a specific reaction type on this host, the necrotic-fleck, mesothetic-X and uredial reactions were found to differ quantitatively in certain physiological respects. A parallel study of several inbreds as hosts, differing in the alleles conditioning reaction to a single line of the pathogen, also revealed differences of this kind between the three reaction types and, in addition, the nonspecificity of the fleck reaction.

BARLEY

1541 Forsøg med bygsorter 1953–58. (**Trials of barley varieties, 1953–58**).
Tidsskr. Planteavl 1959 : **63** : 547–50.

Data are given on six varieties tested for yield of grain and straw under normal and high nitrogen treatment at 14 stations in Denmark. Bonus was highest in yield at the low nitrogen level and was equalled by Hafnia and Mentor at the high.

1542 Zomergerst, 1960. (**Spring barley, 1960**).
Landbouwvoorlichting **16** : Bijl. 56;
Ber. Rassenkeuze 1959 : No. 273 : Pp. 5.

Yield data and notes on performance are presented for 4 malting barleys and 14 fodder barleys tested on different soil types in the Netherlands. Among 16 further varieties studied in preliminary trials, 8 have been retained for further testing.

1543 Chodkov, I. N.
Vyšlechtění nahého bezosinatého ječmene. (**Breeding naked awnless barley**).
Sborn. čsl. Akad. zeměd. Věd: Řada rostlinná Výroba 1959 : **32** : 1176–80.

Soviet research on centres of origin of barley, the regions where naked barley cultivars are found and allied topics are discussed in relation to breeding naked awnless forms of barley at the Institute of Plant Industry. So far only one variety, GB18, of this kind has been bred. It was obtained by crossing a naked hooded six-rowed Chinese form with an awnless hulled Japanese variety called Dundar-beyi. True-breeding plants with the desired characteristics were selected in the F_4. In recent trials GB18 was found to be productive, early, drought resistant and tolerant of salinity; its grain was rich in protein and made good gruel. Recently GB18 has been crossed with Viner and two-rowed naked awnless hybrids with firm straw and grain of even size breeding true for these characteristics have been selected. It is hoped that the hybrids will shortly become available on farms.

1544 **Report of the Barley Committee of the European Brewery Convention. Trials 1958** : Pp. 136.

The results of trials of the field performance of barley varieties grown in 14 European countries during 1958 are summarized. The results of barley and malt analyses are also given. In addition to the obligatory varieties Kenia (standard), Beka, Ingrid, Union and Wisa, the optional varieties Mentor (Abed 978), Sejet 1732, SA x K17/8, Svalöv 50/102 and Volla were sown in many trials. Proctor was grown as a standard for malting quality. Several other varieties, e.g. Carlsberg II, Haisa II and Balder, were also tested in some other countries. Sufficient information on Carlsberg II has now been collected from the trials in the different years and this variety is no longer to be tested; a summary of its performance is provided.

1545 DAVIES, D. R.
Studies of flowering time and morphology in dwarf barley.
Genetica 1959 : **30** : 233–39.

A six-rowed type called "branching", with very short straw, branching stems and numerous nodes, was crossed with two normal varieties. The abnormal type depended on a single recessive gene with pleiotropic effects or a complex of genes so closely linked that no recombinants appeared. Normal segregates were usually earlier in ear emergence than both parents, F_1-F_3 data on earliness being most satisfactorily explained by assuming that the branching parent carried a considerable number of genes for earliness whose expression was inhibited by the recessive gene or complex.

1546 MORRISON, J. W.
Cytogenetic studies in the genus *Hordeum*. III. Pairing in some interspecific and intergeneric hybrids.
Canad. J. Genet. Cyt. 1959 : **1** : No. 1 : 65–77.

From pairing behaviour it was concluded that the genomes of the parents in the following crosses were not homologous: *H. vulgare* x *H. bulbosum*, *H. jubatum* x *Hordelymus europaeus*, *H. depressum* x *Secale cereale* and *H. depressum* x *H. vulgare* [cf. 394]. The two genomes of a spontaneous hybrid of *H. pusillum* were related, although some of the chromosomes probably differed structurally. The observations indicated that, in addition to homology between chromosomes, three other factors affected metaphase pairing, viz. time available for pairing, physiological balance within the cells and chiasma formation between homologues.

1547 YAMAGUCHI, H.
(On the expressivity of an awn character in barley induced by X rays).
Ikushugaku Zasshi/Jap. J. Breeding 1959 : **9** : 28–32. [Japanese].

The mutant was induced in the 4-rowed variety Yoshin and resembles the *subcalcaroides* mutant described by Bandlow [XXIV, 2004] though it appears to be more variable in expression. The range of expression of the mutant in the X_3–X_4 is described. Crosses between the mutant and normal Yoshin or hooded barley showed that the mutant is completely recessive.

1548 MATSUMURA, S. & FUJII, T.
(Studies on the radiation genetics of malting barley. I).
Seiken Jiho/Rep. Kihara Inst. Biol. Res. 1958 : No. 9 : 61–68. [Japanese].

A set of thirteen Japanese and European varieties was irradiated with X rays and γ rays from Co^{60}. Marked intervarietal differences in sensitivity to radiation were noted. Most of the mutants isolated in the X_2 were chlorophyll deficiencies. X rays and γ rays were about equally effective as mutagenic agents.

1549 BAL, B. S., SUNESON, C. A. & RAMAGE, R. T.
Genetic shift during 30 generations of natural selection in barley.
Agron. J. 1959 : **51** : 555–57.

Three F_{30} populations of Composite Cross II were compared with one another and with their 28 parents. Genetic shifts involving 19 characters out of 21 had occurred, the unselected population showing the greatest number of shifts compared with the parents, that selected for large seed an intermediate amount and that selected for small seed the least. The shifts were often strongly influenced by character associations, the unselected population being least affected. There were distinct differences between the populations and some of the characters were clearly independent of seed size. Genes controlling heading date, spike density and kernel weight appeared to be linked with marker genes in linkage group V. The 28 parents contributed unequally to the unselected population.

1550 HANCOCK, N. I.
Holston barley.
Bull. Tenn. agric. Exp. Sta. 1959 : No. 297 : unpaginated.

This upright, stiff-strawed, winter-hardy variety was selected from the cross (Wong x Jackson 1) x

Hooded 6. It matures a week later than Kenbar and is resistant to mildew and scald.

1551 **New Wocus barley released in Oregon.**
Crops & Soils 1959 : **12** : No. 2 : p. 20.

Wocus is a six-rowed, smooth-awned spring variety with a short dense spike. It is well adapted to the Klamath basin where severe frosts occur; Wocus, which has short, stiff straw, has yielded well on organic soils where lodging is frequent. This variety is recommended as a replacement of Hannchen which is used for fodder in this area.

1552 Ključareva, M.
(**The development of chromosomes in the zygote of the barley Pallidum 17**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **127** : 444–47. [Russian].

An account is given of cytological observations on the process of development in the fertilized egg cell of the above cultivar at the Institute of Genetics of the Academy of Sciences. The observations lead to the following conclusions: the nucleoli of the egg and sperm cells in the zygote are at first free from DNA. This later appears in the form of fine threads which stain red with the Feulgen stain. The threads increase in size and on so doing produce chromosomes, thus giving rise to the diploid chromosome complement of the new generation.

1553 Tsuchiya, T.
(**Studies of trisomic barley plants. I. The origin and characteristics of 7 types of single trisomic**).
Seiken Jiho/Rep. Kihara Inst. Biol. Res. 1958 : No. 9 : 69–86. [Japanese].

Fifty-nine single trisomics were obtained from the progenies of autotriploid *Hordeum spontaneum* var. *transcaspicum* and from double and triple trisomics in the same progenies. The single trisomics could be grouped into seven morphological types which are compared with the trisomics described by Ramage [XXVI, 416]. Fertility, especially of the pollen, is usually high in these plants. The frequency of transmission of the extra chromosome averages 28·8% in the ovules and 0% in the pollen.

1554 Bishop, L. B.
Keimträgheit als Sorteneigenschaft. (**Dormancy as a varietal characteristic**).
Mitt. Versuchssta. f. Gärungsgewerbe, Wien 1958 : **12** : 71–73.

Data on dormancy are given for 17 varieties of barley in various European countries over the period 1951–56. Differences according to variety, year and climate were found.

1555 Mazurek J. & Długosz, W.
Białko niektórych odmian jęczmienia browarnego. (**The protein of certain varieties of brewing barley**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1958 : **2** : 371–90.

Varietal differences in protein content and in reaction to locality and year in Poland are noted.

1556 **Quality evaluation of barley varieties and selections grown in 1957.**
Publ. Malt Res. Inst., Madison 1958 : No. 15 : Pp. 16.

Information is tabulated on the malting and brewing performance of a number of varieties grown in different parts of the USA.

1557 **A barley for food and feed.**
Agric. Res., Wash. 1959 : **8** : No. **3** : p. 7.

Hulless barleys developed from crosses between Asian hulless and American commercial varieties have been released in the USA. Comparing favourably with hulled barleys in disease resistance, threshing quality and yield, they have the advantages of 1–3% higher protein content and lower handling and storage costs.

1558 Grafius, J. E.
Heterosis in barley.
Agron. J. 1959 : **51** : 551–54.

On the basis of representing yield as the volume of a rectangular parallelepiped whose edges, X, Y and Z, are respectively equivalent to heads per plant, seeds per head and average seed weight [cf. XXVII, 1664], it was found that correlations between X, Y and Z in four different F_2s were either small or zero. This, together with the fact that the parents exhibit all combinations of high and low values for X, Y and Z, strongly suggests that quantitative genes for yield *per se* do not exist. Thus there can be no dominance or overdominance of yield genes or heritability of yield, and changes in yield and the occurrence of F_1 heterosis for yield must be due to epistatic interactions between X, Y and Z. It is shown that a fourth component, time of heading, affects X and Y and allows a large part of the F_1 vigour to be fixed in true-breeding forms. Estimates of the F_1 and F_2 values for X, Y and Z were close to the observed values.

1559 Ralski, E. & Mikołajewicz, T.
Z badań nad wrażliwością form jęczmienia na mączniaka właściwego (*Erysiphe graminis* DC f. *hordei* Marchal. [**From the investigations on the susceptibility of barley forms to powdery mildew (*E. graminis* DC. f. *hordei* Marchal)**].
Hodowla Roślin Aklimatyz. Nasiennictwo 1958 : **2** : 313–33.

In tests of numerous varieties at the Bąków Breeding Research Station, Poland, Abyssinian 5336, B2145, C175, B18, Europeum, Flauengerste, Milenium, New Universal and Nutans 17 combined resistance with desirable economic properties; a few resistant varieties with less valuable characteristics were also identified. All local Polish varieties proved highly susceptible. The three physiological races C_2, C_3 and C_4 were isolated, C_2 being the most prevalent.

1560 Rochow, W. F.
Transmission of strains of barley yellow dwarf virus by two aphid species.
Phytopathology 1959 : **49** : 744–48.

While strains of the above virus transmitted by *Rhopalosiphum fitchii* in the New York area are considered to be similar to strains reported from other areas of the United States, isolates transmitted by *Macrosiphum granarium*, while common in the New York area, differ from strains reported from other areas.

1561 Hänsel, H.
Untersuchungen zur Unterscheidung von Gerstensorten durch die Phenolreaktion. (**Investigations of the differentiation of barley varieties by the phenol reaction**).
Mitt. VersAnst. Gärungsgew. 1958 : **12** : 74–77.

Data are presented showing the degree of staining of the grain of numerous varieties when treated with an aqueous solution for different lengths of time and at different concentrations. Crossing experiments indicated that the staining reaction is dominant over nonstaining and is monogenically inherited.

MILLETS AND SORGHUMS

1562 L., A.
Varietà di miglio ibrido foraggera per le zone aride. (**A forage variety of hybrid millet for arid zones**).
Ital. agric. 1959 : **96** : 965–66.

The merits of Georgia Hybrid 1 of *Pennisetum glaucum* are described.

1563 Tulach, J., Štefl, M., Cvrk, B. & Petr, J.
Biochemické sledování našich odrůd prosa. (**A biochemical investigation of our varieties of millet**).
Sborn. čsl. Akad. zeměd. Věd: Řada rostlinná Výroba 1959 : **32** : 1159–66.

The results are reported of biochemical analyses of Czechoslovakian and Soviet millets. Har'kov millet was the richest in starch but contained the least fat. Czechoslovakian varieties contained slightly more ash than the Soviet varieties and most of their fat content was in the grain rather than in the husk, whereas a large part of the fat of the Soviet varieties was found in the husks. No quantitative differences between varieties in aminoacid content were found.

1564 Subramaniam, A. & Anavaradham, L.
Population and yield studies in hybrid X-3 bajra (*Pennisetum typhoides*).
Madras agric. J. 1959 : **46** : 398–99.

Released in 1958, the F_1 hybrid X-3 is suitable for growing with and without irrigation in the entire state of Madras. Ripening in about 85 days from sowing, it produces up to 2500 lb. of grain per acre and has the advantage of good threshability. The results of an analysis of the effects of density of population upon yield and its components in X–3 are reported.

1565 Desai, M. C., Majmudar, V. F. & Thombre, M. V.
A narrow leaf mutant in bajri (*Pennisetum typhoides* S and H).
Poona agric. Coll. Mag. 1959 : **50** : No. 1 : p. 37.

A few abnormal plants have been observed which suggest possible gene mutation. Leaves are small, narrow and dark green in colour. The inflorescence is small with spikelets arranged on opposite sides only. Meiosis is normal.

1566 Desai, M. C., Majumdar, V. F. & Thombre, M. V.
A naked flower mutant in pearl millet *Pennisetum typhoides* (Burm.) S & H.
Sci. & Cult. 1959 : **25** : 207–08.

A sterile variant possessing spikelets with only outer glumes and undeveloped anthers and ovary is described.

1567 Gildenhuys, P. J. & Brix, K.
Apomixis in *Pennisetum dubium*.
S. Afr. J. agric. Sci. 1959 : **2** : 231–45.

Pollen meiosis in *P. dubium* ($2n = 66$) is irregular. However, polyploidy is maintained by facultative apospory. It is difficult to distinguish aposporic from meiotic embryo sacs; the four-nucleate embryo sac is not by itself conclusive evidence of apospory. It appears that fertilization of at least the polar nucleus is required for endosperm development.

1568 LAKSHMANAIAH, C. H.
A preliminary note on improvement of ragi (*Eleusine coracana* Gaertn).
Mysore agric. J. 1959 : **34** : 28–34.

The recently developed, early-maturing variety Aruna was crossed with a late-maturing variety, K–1. Two promising, early-maturing varieties, Udaya and Purna, were produced whose yield in both cases was significantly greater than that of the parents. Both mature evenly within 100–105 days. While the rachis of Udaya becomes brittle when dry and sheds grain if harvesting is delayed, that of Purna stays soft when dry and no grain shedding occurs. The inflorescence of Udaya is purple and open, while that of Purna is pale purple with a curved top.

1569 MEENAKSHI, K.
A dwarf bud mutant in *Sorghum*.
Madras agric. J. 1959 : **46** : 309–10.

A dwarf mutant of *S. subglabrescens* 'Coimbatore 9' depends upon a single recessive gene, which may be the same as that responsible for the "tiny" mutant described by Rangaswami Ayyangar and Kunhi Krishnan Nambiar [IX, 578].

1570 SREERAMULU, C.
A note on the inheritance of height in *Sorghum*.
Curr. Sci. 1959 : **28** : 412–13.

Sorghum caudatum 'AS4003', which is short and exhibits a unimodal type of internode distribution, was crossed with *S. durra* 'G2 Jonna', which is tall with the internodes increasing uniformly in length along the stem.
The F_1 hybrids were all of medium height with uniformly increasing internodes. In the F_2, medium-sized plants with long, uniformly increasing internodes conformed to a 3 : 1 ratio in respect of short plants with short internodes of the unimodal type. Thus the uniformly increasing internodes are completely dominant over the unimodal type but tallness is only partially dominant.

1571 **Hybrid sorghum outyields open-pollinated varieties.**
Crops & Soils 1959 : **12** : No. 1 : p. 33.

In a test at the Kentucky Agricultural Experiment Station, the best yields (106–116 bushels per acre) were obtained from Dekalb D–50a, PAG515S, Plainsman, AMAK R–12, RS610 and Texas 601.

1572 **Dual sorghum is released by South Dakota Station.**
Crops & Soils 1959 : **12** : No. 1 : p. 20.

Dual [cf. XXIX, 1558] has given high yields of good forage. The large seeds make combining easy and the tannic acid and prussic acid contents are low. It matures at the same time as Reliance and Norghum; the spreading habit of the panicles facilitates drying of the grain at maturity and Dual has less aphid infestation than varieties with compact heads.

1573 SHARMA, B. S.
Isolation of a perennial sorghum.
Curr. Sci. 1959 : **28** : p. 408.

Preliminary notice is given of a rust-resistant perennial sorghum of high yield. Within the temperature range 10°–40° C. it flowers "perpetually" and several crops can be obtained in a year. It is able to withstand heavy rain, hail storms and drought.

1574 ROSS, W. M. & WEBSTER, O. J.
Additional notes on stigma receptivity in cytoplasmic male-sterile sorghum.
Agron. J. 1959 : **51** : p. 632.

Observations on seed set on unbagged panicles of ♂-sterile forms of commercial varieties revealed differences in duration of stigma receptivity, the semicompact variety Combine Kafir 60 having an advantage over the semiloose types Martin and Westland. The possible significance of this finding in relation to hybrid-seed production is briefly considered.

1575 WILLIAMS, C. N.
Resistance of *Sorghum* to witchweed.
Nature, Lond. 1959 : **184** : 1511–12.

The nature of the reactions of *S. vulgare* 'Framida' from South Africa and the Nigerian variety Light Mori, respectively resistant and susceptible to witchweed (*Striga lutea*), was studied at the Botany Department, University College, Ibadan. The results of germination tests of the seeds of the parasite in solutions eluted from the roots with distilled water indicated that resistance depended mainly on the production of a lower amount of a substance with a stimulatory effect on germination. Interaction of an inhibitor with the stimulatory substance also appeared to play a part in reducing germination. It is suggested that resistance of the type found in Framida may be expected to be successful against all species and physiological strains of

Striga. The root-solution technique offers a simple means of testing a large number of varieties.

1576 Keulemans, N. C.
Photoperiodiciteit bij *Sorghum vulgare* Pers. (**Photoperiodicity in *S. vulgare* Pers.**).
Proefschr. LandbHoogesch. Wageningen 1959 : Pp. 107.

Data are given on the effects of photoperiod upon development and of different light intensities and temperature upon photoperiodic response in sorghum varieties. The crop behaves as a short-day plant with an optimum day length of about 10 hr. Among 30 varieties obtained from different countries, sensitivity to photoperiod tended to decrease with increasing distance from the equator.

RICE

1577 Kishikawa, H.
(**The effect of ultrasonic waves on rice**).
Saga Daigaku Nogaku Iho/Agric. Bull Saga Univ. 1955 : No. 3 : 1–13. [Japanese].

Treatment of germinating grains of three varieties with ultrasonic waves (947 kilocycles/sec.) induced little in the way of changes in biometrical characters in the F_0 compared with the controls.

1578 Chang, H. S.
The rice breeding program and its recent development in Taiwan.
News Lett. FAO Internat. Rice Comm. 1959 : **8** : No. 2 : 1–8.

A review is given of current breeding programmes designed to produce Peng-lai (= Horai) rice varieties which are high yielding and blast resistant over a wide ecological range. Four varieties are recommended. Varieties suitable for particular regions are also listed.

Preliminary results of irradiating Peng-lai rice seeds with X rays, γ rays from Co^{60} and thermal neutrons are said to be encouraging.

A promising new variety, Taichung Native 1, has been developed from local *indica* varieties. It is a high-yielding, stiff-strawed variety suitable for both spring and autumn crops.

1579 Ananthakrishna Rao, P. N.
A brief review of the results of research obtained at the Paddy Breeding Station, Mangalore.
Mysore agric. J. 1959 : **34** : 42–48.

An account is given of variety trials conducted at the station since 1945. Reselection of the varieties Kayama, Mascathy, Halluga and Athikraya, and pure-line selection of Guddubolliari, Kanwa, Doddrai and Pasabanavara have resulted in the development of six new strains. These are: MGL1 from Guddubolliari, MGL2 from Kayama, MGL3 from Halluga, MGL4 from Kanwa, MBL5 from Mascathy and MGL6 from Athikraya.

The main problems of the district are lodging and loss of seed viability during the monsoon months. MGL1 x MTU3 and PTB11 x MTU4 crosses were made in an attempt to develop nonlodging strains of MGL1 and PTB11. A few cultures are under yield trials.

Certain natural crosses of Kavunginpoothala x Co.3 were isolated in an attempt to evolve a Co.3 strain which does not lose seed viability. One promising strain, 8360, is being multiplied.

1580 Yang, S.-J. & Chao, C.-S.
(**Studies on the problem of hybridizing Hsien and Keng rices**).
Nung-yeh-hsueh Pao (J. Agric.)/Act. agric. sin. 1959 : **10** : 256–68. [Chinese].

Promising strains have been obtained from selecting advanced generations of crosses between the above two varietal groups. Sterility can be eliminated by selection. Descriptions are given of the agronomic characteristics of Hsien-Keng hybrids 1 to 8, all derived from the cross Nan-te-hao [Southern Special] Hsien rice x Chia-li Keng rice.

1581 Campos, F. F., Capinpin, J. M. & Espiritu, L. G.
Radiation genetic studies on rice (*O. sativa*). I. Observations among the X_1 plants.
Philipp. Agric. 1959 : **43** : 200–08.

The variety Milfor 6 was subjected to X-ray doses of 2–50 kr. The highest frequency of induced mutants occurred at 10 kr. The majority of these were chlorophyll-deficient.

One promising mutant was isolated from the 2 kr. treated set. Initially slow by harvest time its growth rate exceeded that of the control, producing three times as many productive tillers. The seeds produced by it exhibited segregation of hull and endosperm colour.

1582 Chang, W.-T.
(**Variation in quantitative characters induced in rice by X rays**).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China New Ser. : 1959 : No. 25 : 33–43. [Chinese].

Significant increase in the heritable variation in heading date (in both directions) resulted from X irradiation of the Taiwan variety Pai-kou [White Husk] and the Japanese variety Kisshin. Significant increases in heritable variation were not obtained for tiller number and were doubtful for plant height.

1583 JOGLEKAR, R. G. & DHODAPKAR, D. R.
New paddy selections for the drier regions of Vidarbha.
Nagpur agric. Coll. Mag. 1959 : **33** : 17–19.

Two new strains, N22 and N27, have been selected from the natural crossing of an introduced variety Nasik with local strains. Both are suitable for dry areas. They mature early and give good yields. Grain of N22 is of medium texture, while grain of N27 is reported as very fine.

1584 PIACCO, R.
Precoce Monticelli, una nuova varietà di riso. (**Monticelli Early, a new variety of rice**).
Riso, Milano 1959 : **8** : No. 10 : 11–13.

The variety described arose from a selection of Balillone, thought to be a natural hybrid. It has straw of medium stature, resistant to lodging and diseases; its grain is pearly and classed as semifine. It matures 10 days before Balillone but gives good yields.

1585 BHADURI, P. N., NATARAJAN, A. T. & MOHANTY, N. R.
Pollen mitosis in paddy.
Indian J. Genet. 1958 : **18** : 249–51.

Of the several techniques used for staining pollen, the most satisfactory involved pretreatment of the anthers with 0·2% colchicine before fixing and then staining with propionocarmine.

1586 CHALAM, G. V., MOHANTY, H. K. & MALLICK, B.
A dwarf mutant in rice by beta rays from radiophosphorus.
Sci. & Cult. 1959 : **25** : 202–03.

A sterile, dwarf plant appeared in the progeny of plants raised from seeds treated with $NaHP^{32}O_4$. Preliminary cytological observations suggest that the plant may be a monosomic. Sufficient seed for further study has been secured by spraying with gibberellic acid.

1587 FUJII, Y. & TANAKA, N.
(**Aerenchyma in the roots and leaves of rice. III. On the movement of air following pressure reduction in the underground parts of rice seedlings and the length of the vegetative period**).
Saga Daigaku Nogaku Iho/Agric. Bull. Saga Univ. 1955 : No. **3** : 14–21. [Japanese].

In experiments in which atmospheric pressure around the roots of various varieties was reduced, it was found that the rate of movement of air through the aerenchyma from the leaves to the roots was positively correlated with the length of the vegetative period. This correlation is attributed to the better developed aerenchyma of late varieties [cf. XXVI, 3376].

1588 FUJII, Y. & TANAKA, N.
(**Aerenchyma in the roots and leaves of rice. IV. On the supply of oxygen to the roots from the leaves in rice seedlings and the length of the vegetative period**).
Saga Daigaku Nogaku Iho/Agric. Bull. Saga Univ. 1955 : No. **3** : 22–29. [Japanese].

Further to the conclusions reached in the preceding paper, it was shown that oxygen consumption by the roots and the increase in oxygen consumption by the roots when the overground parts were cut in a series of varieties were positively correlated with the length of the vegetative period.

1589 YANG, K.-C., SUN, H.-H. & WANG, C.-Y.
(**Studies on rice varieties suitable for growing as a second crop in the season and on their period of cultivation**).
Nung-yeh-hsueh Pao (J. Agric.)/Act. agric. sin. 1959 : **10** : 221–55. [Chinese].

Numerous varieties have been tested for suitability as a second crop in the season in north and west Szechwan. The most suitable type was midseason Keng rice. The following varieties proved most satisfactory for this purpose: the Yueh-chin[Dash Forward] strains 1 to 7, Wei-kuo, Chuan-ta Keng rice, Chu-hua-chiu, Ping-hu-yao-ai-tsu, Ma-hsien and Yuan-tsu 2.

1590 SEN, P. K. & BOSE, T. C.
Effect of growth-regulating substances on rice.
Indian Agric. 1959 : **3** : 13–16.

Bhutmuri, a day-neutral, early-maturing

variety, and Patnai-23, a short-day, late-maturing variety, were treated with different concentrations of indole-3-acetic acid (IAA) and maleic hydrazide (MH).

After seed treatment, Patnai-23 flowered significantly earlier with both substances while in Bhutmuri flowering was delayed. Foliar sprays with these substances, however, delayed flowering in both varieties. In both varieties plant growth was stimulated by IAA and retarded by MH. Neither substance increased yield.

1591 NOGUCHI, Y. & KAMATA, E.

Studies on the control of flower bud formation by temperature and day-length in rice plants. II. Determination of the stage affected by high temperature for induction of flower bud.

Ikushugaku Zasshi/Jap. J. Breeding 1959 : **9** : 33–40.

The early-maturing Japanese varieties Norin 11 [Ministry of Agriculture and Forestry 11], Iburiwase [Iburi Early], Wasebozu [Early Bonze], Kinugasawase [Kinugasa Early] and Hayashio were temperature sensitive, flower-bud formation and therefore heading being hastened by high temperature [cf. XXIX, 3907]. The early-maturing variety Kamenoo was however insensitive to temperature. Heading in late-maturing Norin 18 showed the expected insensitivity to temperature. Norin 11 was the most sensitive to high temperature, requiring only about 40 days from sowing to heading when grown in the greenhouse at 27°–30° C. or when sown out-of-doors in July with a mean daily temperature of about 25° C. As shown by an experiment on this variety, shortage of N tended to hasten heading, irrespectively of the temperature, whereas P deficiency delayed heading, particularly at low temperature. Cutting off the fourth leaf of seedlings of Norin 11 delayed heading; production of a substance by this leaf promoting flower-bud formation appeared therefore to be checked. In a further experiment on Norin 11, vegetative development was held back by appropriate cultural conditions. Four proved to be the minimum number of leaves formed before ear emergence, suggesting that in this variety the "basic vegetative growth", i.e. the growth after germination which cannot be eliminated by environmental conditions, ends during the development of the fourth leaf, presumably when the material produced by this leaf reaches the growing tip of the stem and begins to act.

1592 OKA, H. I.

Intervarietal variation and classification of cultivated rice.

Indian J. Genet. 1958 : **18** : 79–89.

Intervarietal variation in 12 characters was investigated in 120 varieties from various countries. A positive phenol reaction was found to be associated with susceptibility to potassium chlorate and low temperature, resistance to drought, awnlessness, rapid germination, rapid ripening of the endosperm, short glume hairs, easy shedding of the grain and considerable destruction of the endosperm by potassium hydroxide. Varieties with negative phenol reaction show the opposite tendencies. Correlation coefficients for the associated characters are in most cases highly significant. The five characters, phenol reaction, resistance to potassium chlorate, low temperature and drought, and awn length, show discontinuous varietal variation. Varieties can be divided into two groups according to the combination of these five characters. The Continental group is predominant in India, Indochina and most of China whilst the Insular group is predominant in Indonesia, the Philippines and mountainous parts of China; the two groups correspond to the *indica* and *japonica* varieties. The characters differentiating the two groups do not show much variation within groups. Other characters such as the length-width ratio of the grain and the first internode length show marked within-group variation, especially in the Insular group, which can be divided into the Tropical-Insular and Temperate-Insular subgroups; these differ in many characters and in their geographical distribution. Discriminate functions were constructed to maximize the differences between groups and a continuous array of intergrades was found between the Continental and Insular groups, the variation between the Tropical-Insular and Temperate-Insular groups being completely continuous.

Seven varieties were intercrossed and the fertility of the F_1 hybrids was measured by the percentage of good pollen produced. Varieties were then classified into groups according to their compatibility relationships. These groups were found to correspond to the Continental, Tropical-Insular and Temperate-Insular groups.

1593 **World catalogue of genetic stocks. Rice.**

FAO, UN, Rome 1959 : Suppl. No. 7 : Pp. iii + 12.

This issue gives additional and revised information on stocks maintained in India, Iraq, Madagascar and the Philippines [cf. XXVIII, 2999].

1594 Yang, H.-F. & Sha, K.-F.
(**Preliminary experimental studies on rice lodging**).
Nung-yeh-hsueh Pao (J. Agric.)/Act. agric. sin. 1959 : **10** : 311–17. [Chinese].

In the course of these investigations into the various factors responsible for lodging, it is noted that Hsien varieties tend to lodge readily. Some midseason and late Keng varieties that are resistant to lodging are noted.

1595 Hashimoto, T. & Masumoto, M.
(**The relations between the morphological and dynamic characters of rice culms and type of lodging**).
Hiroshima Nogyo Tanki Daigaku Kenkyu Hokoku/Bull. Hiroshima agric. Coll. 1959 : **1** : No. 2 : 10–12. [Japanese].

Two types of lodging are distinguished among the 10 varieties studied: (1) the culm breaks near the base; and (2) the culm only bends over. It was found that culm breaking is more frequent in varieties in which few heavy panicles rather than many smaller panicles are produced. Breakage is also positively correlated with culm length and Young's modulus.

1596 Szepes, J.
Histological examinations to determine the resistance of different rice varieties to blast.
Acta agron., Budapest 1959 : **9** : 137–54.

The degree of blast damage was diagnosed by measuring the area of brown discoloration in the cross section of the lowest node. Blast incidence varied according to soil and could be increased by cooling the soil and irrigation water, by inoculation with *Piricularia* and by heavy N fertilizer treatment. Of the five varieties tested, Pallagi 73 and Uz Ross 17 were the most resistant.

1597 Lin, K.-M. & Lin, P.-C.
(**Investigations on the relations between irradiation treatment of rice and resistance to leaf blast**).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China : New Ser. 1959 : No. 26 : 39–43. [Chinese].

Strains of the Peng-lai (= Horai) variety Taichung 65 with improved resistance to blast have been obtained after irradiation with 20,000–25,000 r. X rays, 11,000 r. γ rays from Co^{60}, or 15–20 hr. thermal neutrons.

1598 Parthasarathy, N.
The need for rice varieties with wider adaptability.
News Lett. FAO Internat. Rice Comm. 1959 : **8** : No. 2 : 20–25.

Stress is laid on the importance of photoperiod sensitivity as a factor limiting the ecological range of many rice varieties in south-east Asia. A search for nonsensitive source material has resulted in the isolation of four generally adapted varieties. These are Khao Ta Hueng (Thailand), Siam 29 (Malaya), GEB24 (Madras, India) and Tai-chung 65 (Taiwan). Breeding programmes using these varieties as basic material are now in progress.

MINOR CEREALS

1599 Murakami, M. & Harada, K.
(**Studies on the improvement by means of breeding of the genus *Coix*. I. On F_1 plants from the interspecific cross *C. ma-yuen* x *C. lachryma-jobi***).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1958 : No. 10 : 111–20. [Japanese].

F_1 plants from crosses between *C. ma-yuen* (= *C. lachryma-jobi* var. *ma-yuen*) and typical *C. lachryma-jobi* are readily obtained and show heterosis for height, tiller number, leaf width and plant weight. Fertility in the F_1 plants is rather lower than in either parent. Stigma colour is reddish-violet in the F_1 though white in both parents. Seed shape and colour of the hybrid resemble those of typical *C. lachryma-jobi*. The F_1 plants are perennial in contrast to var. *ma-yuen* and show promise as forage plants.

FORAGE GRASSES

1600 Katayama, Y., Nagatomo, T., Kozaki, M. & Shida, S.
(**Studies on breeding forage crops**).
Miyazaki Daigaku Nogakubu Kenkyu Jiho/Bull. Fac. Agric. Univ. Miyazaki 1958 : **4** : No. 1 : 60–68. [Japanese].

Oats. Data are provided on the relative value of locally grown forage varieties.
Sudan grass. Four strains were compared in respect of forage yields at four cutting dates.
Lupin. Hybridization experiments involving yellow, blue and white lupins and bitter and sweet strains are reported. An improved method for detecting alkaloid in yellow lupin is described.

Groundnut. The forage production of a series of locally grown strains was ascertained.

1601 Murakami, M.
(Bulk emasculation methods for forage plants. III. Hot-water emasculation of Sudan grass and meadow foxtail).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1958 : No. 10 : 121–26. [Japanese].

The best treatment for Sudan grass was 12 min. at 45° C. and for *Alopecurus pratensis* 15 min. at 43° C. [cf. XXVII, 4082].

1602 Kalton, R. R.
Seed production problems in isolated recombination blocks.
Agron. J. 1959 : **51** : p. 629.

Attention is drawn to limitations in the use of isolated recombination blocks in forage-crop breeding, as the result of differences between clones or lines in seed and pollen production. In illustration of the problem, data are given on the mean seed yields of clones in recombination blocks of two cocksfoot synthetics at the Iowa Agricultural Experiment Station, Ames. The various cultural practices, block lay-out and method of compositing the seed adopted at this station to minimize the effects of differentials in seed production of synthetics are described. The value of the procedures is to be determined by testing synthetics and polycrosses of different clones produced in the same combinations in different years and blocks.

1603 Forbriger, E.
Methoden zur Prüfung von Futterpflanzenzuchtmaterial auf Kombinationsfähigkeit und deren Bedeutung für die Futterpflanzenzüchtung. **(Methods for testing fodder-plant material for combining ability and their importance for fodder plant breeding).**
Z. Pflanzenz. 1959 : **41** : 343–70.

This full review includes definitions of combining ability and descriptions of well known methods of testing for combining ability. From the literature, it appears that the polycross, top-cross and open-pollination methods are useful in fodder-plant breeding. The problem of how many clones or lines with high combining ability should be used in breeding synthetics is discussed; it appears that the best number varies between 4 and 10, depending on the species, degree of polyploidy and other factors. In testing for combining ability it is important to use clones which flower at exactly the same time so that all the clones are pollinated with a homogeneous mixture of pollen.

1604 Hanson, A. A.
Grass varieties in the United States.
Agric. Handb. US Dep. Agric. 1959 : No. 170 : Pp. 72.

Information is provided on named and experimental varieties with respect to origin, method of breeding, main characteristics, release and seed supplies.

1605 McMillan, C.
The role of ecotypic variation in the distribution of the central grassland of North America.
Ecol. Monogr. 1959 : **29** : 285–308.

Clones representing communities of various species growing in the central grasslands of the USA and Canada were subjected to developmental studies in a transplant garden at Lincoln, Nebr. Two patterns of ecotypic variation in flowering were displayed in the transplant garden. In the first, seen in *Koeleria cristata, Bouteloua gracilis, B. curtipendula, Panicum virgatum, Schizachyrium scoparium,* the *Andropogon gerardi-hallii* complex, *Sorghastrum nutans* and *Sporobolus heterolepis,* clones from the northern and western communities were early in flowering and those from sites towards the south and east later. In the second, shown only by *Elymus canadensis,* the earliest flowering clones were from southern communities, the intermediate from northern and western sites and the latest from eastern sites. A geographically oriented trend in time of flowering was absent in the remaining species studied, *Stipa spartea, S. comata* and *Oryzopsis hymenoides.* In six of the eight species exhibiting the first type of pattern, height and time of flowering were associated, earlier clones having shorter stature. No geographical trend in time of spring activity was detected. Data on the six taxa studied in the greenhouse for their photoperiodic reactions were also indicative of a genetic basis for intraspecific disparities in time of flowering. Pattern of flowering behaviour in natural habitats did not necessarily correspond closely with that observed in the transplant garden. The evolution of grassland species and communities in North America is discussed.

1606 Wiinstedt, A. K.
Noter om danske græsser. *Festuca ovina*-gruppen og *Bromus mollis*-gruppen. **(Notes on Danish grasses. The *F. ovina* group and the *B. mollis* group.)**
Bot. Tidsskr. 1959 : **55** : 42–46.

A discussion of nomenclature in the *F. ovina* group and a key to the Danish species are presented. The central European species *F. guestphalica* and *F. laevigata* are shown to occur in Denmark. In the *B. mollis* group, a form sometimes referred to as var. *leiostachys* or *leptostachys* is regarded as a hybrid of *B. mollis* and *B. racemosus*, and since it is often fertile it may be considered as a distinct species, *B. glabratus*.

1607 **Report on herbage plant exploration in the Mediterranean region.**
FAO, UN, Rome 1955 : No. 415 : Pp. 39. (Mimeographed).

A report is given of the project jointly undertaken by FAO and the Commonwealth Scientific and Industrial Research Organization of Australia in 1954 to collect ecotypes of pasture grasses and legumes from the natural vegetation of the Mediterranean region, for direct use or as breeding material in various countries.

1608 Barling, D. M.
Biological studies in *Poa angustifolia*.
Watsonia 1959 : **4** : 147–68.

Taxonomic studies of *P. pratensis* by several investigators have suggested that it is represented by at least four subspecific types, of which *P. angustifolia* is one. Populations of *P. angustifolia* in rough swards in the Cotswolds, Glos., England, show considerable variation in morphological and phenological characters. Both transplant and field observations emphasized the need for careful analysis of *P. angustifolia* where associated with other forms of *P. pratensis*. Floral biology suggested that cross pollination is normal in *P. angustifolia* but evidence consistent with apomixis was obtained from some plants. Self fertility was variable but usually very high. Chromosome numbers ranged from $2n = ca.$ 52 to *ca.* 61. Bivalent pairing in PMCs was regular, the number of univalents being only $3{\cdot}9 \pm 0{\cdot}37$. The high pollen fertility indicated that this univalent formation was insufficient to disturb pollen production. Polyembryony was common. Preliminary data on seedling morphology suggested that *P. angustifolia* and other forms of *P. pratensis* may differ at this stage. *P. angustifolia* is essentially a colonist of well-drained soils subjected to low intensity of agricultural management, its early but short season of active growth being suited to such areas. It may thus be regarded as a distinct physiological type, within which a versatile breeding system allows the rapid multiplication of well-adapted biotypes through apomixis, whilst sexual reproduction of other forms permits hybridization and segregation of new genotypes. Apomixis is probably the means by which it maintains taxonomic distinctness in habitats in which other forms of *P. pratensis* may be in contact with it.

1609 Kreitlow, K. W. & Juska, F. V.
Susceptibility of Merion and other Kentucky bluegrass varieties to stripe smut (*Ustilago striiformis*).
Agron. J. 1959 : **51** : 596–97.

Varieties and selections of *Poa pratensis* other than Merion, the common type, and Troy may be considered to be moderately to highly resistant to *U. striiformis*. The possibility of breeding for resistance is briefly referred to.

1610 Hanson, A. A. & Juska, F. V.
A 'progressive' mutation induced in *Poa pratensis* L. by ionizing radiation.
Nature, Lond. 1959 : **184** : 1000–01.

The ten-plant N_2 progeny derived from a plant of *P. pratensis* 'Merion' raised from seed exposed to thermal neutrons for 25 hr. (total dose, $6{\cdot}50 \times 10^{13}$n) remained free from stem rust (*Puccinia graminis*) throughout the growing season. The plants in this progeny were similar in type and indistinguishable from spaced plants of the parent variety. It is concluded that the resistant N_1 apomict resulted from induced mutation.

1611 Caputa, J.
Valeur culturale de quelques variétés sélectionnées de graminées fourragères. **(The cultural value of some selected varieties of forage Gramineae).**
Rev. rom. Agric. 1959 : **15** : 83–85.

The results are reported of trials of cocksfoot and meadow fescue grown as single crops and in mixtures with clover in French-speaking Switzerland. None of the foreign varieties tested was completely adapted to Swiss methods of cultivation but the German meadow fescue, Steinach, appeared to be very vigorous. Emphasis is laid on the necessity of breeding improved varieties of forage plants in Switzerland.

1612 **Newly licensed variety.**
Seed Scoop 1959 : **6** : No. 1 : p. 8.

The new orchard grass Chinook was selected at the Lethbridge Research Station, mainly for winter hardiness; it gives a satisfactory yield of forage and recovers quickly. Also Chinook is a good seed producer. It matures early and this makes it particularly suitable for irrigated pastures in southern Alberta.

1613 ZOHARY, D. & NUR, U.
Natural triploids in the orchard grass, *Dactylis glomerata* L., polyploid complex and their significance for gene flow from diploid to tetraploid levels.
Evolution, NY 1959 : **13** : 311–17.

Natural triploids have been found in localities in Israel where 2*x* and 4*x* populations are in contact. The two triploids chosen for further study set seed *in situ*. Their progeny consisted mostly of tetraploids and, to a lesser extent, pentaploids and aneuploids. The triploids therefore apparently produced a large proportion of unreduced eggs. Most of the pentaploids and all the aneuploids were poor in vigour. Since the tetraploids were vigorous, however, triploids may be regarded as an efficient one-way means of gene flow from diploids to tetraploids. The significance of such a type of introgression in the evolution of a tetraploid superstructure in autopolyploid complexes is discussed.

1614 BRADSHAW, A. D.
Population differentiation in *Agrostis tenuis* Sibth. I. Morphological differentiation.
New Phytol. 1959 : **58** : 208–27.

Sixty tillers were collected from each of 33 areas, mainly in central Wales. In a subsequent experiment five of these areas were sampled again by tillers and in addition by seed. The samples from the first and second collections were grown under garden conditions at Aberystwyth and Bangor, respectively, measurements being made on inflorescence height, vegetative height, plant diameter, density of inflorescences and several other characters. Values for populations sampled by seed and tillers were in close agreement. The main conclusions reached were as follows. The environment is the predominating factor in determining differentiation between populations. Distances no greater than 50 m. may be considered as sufficient for the effective isolation of populations. Thus the species is able to evolve under the influence of natural selection in response to very local variations in environment. Since the environment is a graded patchwork of different conditions, the pattern of differentiation parallels this environmental variation and thus it is not possible to make an objective classification of such intraspecific variation into ecotypes, ecodemes or any other units. It is suggested that this classificatory difficulty is likely to be found in most other outbreeding, continuously distributed species occupying a wide range of habitats.

1615 NIELSEN, E. L. & SMITH, D. C.
Chlorophyll inheritance patterns and extent of natural self-pollination in timothy.
Euphytica, Wageningen 1959 : **8** : 169–79.

In 365 S_1 and 234 S_2 seedling populations of *Phleum pratense* and in open-pollinated progenies, no clear-cut segregation of chlorophyll deficient forms was found; ratios of normal to deficient plants showed a continuous variation from 4·6 : 1 to 572 : 1 in the S_1 and from 1·8 : 1 to 244 : 1 in the S_2. Unexpectedly high frequencies of deficient plants were found in the open-pollinated progenies. From a comparison of the frequencies of deficient plants in the progenies of selfed and open-pollinated plants, it is estimated that an average of about 14% natural selfing occurred during open pollination, on the assumption that inheritance is of the tetradisomic pattern or simpler; when due allowances were made for various factors leading to overestimation, the percentage was about 7·7%. When hexasomic inheritance was assumed, only a few groups of seedlings gave lower selfing values.

1616 **New turf Bermudas for Southwest region.**
Crops & Soils 1959 : **12** : No. 1 : p. 20.

Three improved varieties of Bermuda grass have been developed for lawns in southern New Mexico. Texturf 10 is a dark green variety of medium to coarse texture; it withstands foot traffic well and the tight dense turf prevents invasion by weeds. Texturf 10 requires mowing every 7 to 8 days; a dead layer of grass tends to form under the green top hindering mowing and preventing the penetration of water into the soil. Tifgreen is a fine-textured low-growing grass of light colour; it is suitable for home lawns, parks and golf-course greens. The turf is particularly dense and it can be mowed closer to the ground than other Bermuda varieties. If overfertilized it tends to produce many short seed heads. Ormond is noteworthy for its good dark colour; the dense turf recovers well in spring and withstands cool autumn nights without loss of colour. This variety can be used for home lawns, parks and possibly golf-course fairways and tees. It grows rapidly, requiring mowing every four or five days.

1617 Martin, J. A., Crawford, J. H. & Rhodes, W. H.
Sunturf Bermuda. A new lawn grass for South Carolina.
Circ. SC agric. Exp. Sta. 1956 : No. 108 : unpaginated.

A drought-resistant lawn grass, termed *Cynodon magennissii*, which was introduced from South Africa, has been released in the southern states of the USA. Said to be a triploid natural hybrid between *C. dactylon* and *C. transvaalensis*, it possesses few underground rhizomes and spreads by surface runners to give a thick turf. It is not recommended for shaded areas.

1618 Ives, J. D. & Thomas, H. L.
The randomness of pollination in a polycross nursery of smooth brome-grass, *Bromus inermis* Leyss.
Agron. J. 1959 : **51** : 623–24.

During the period 1951–55, an experiment was conducted consisting of 15 randomized replications, each of which contained 6 clones, 20 single crosses among these clones and the polycross progeny from each clone, making 32 entries in all. Each plot contained 2 adjacent individual plants of a particular genotype or genotypic group (single cross or polycross). Seed was harvested in 1954 from this parent nursery, keeping the seed separate from each replication and bulking only that from the two plants in each plot. The progeny-test nursery contained 6 replications of 90 entries, i.e. seed of the 6 clones from each of the 15 replications. Five plants were established in each plot. In both the parent and progeny nurseries, the plants were spaced 4 x 4 ft. Since 5 of the 15 replications in the parent nursery gave insufficient seed of some clones, some substitutions of seed from neighbouring replications were made. Data are however reported only for the 10 replications providing sufficient seed. Only one of the 13 characters studied was affected by replication, i.e. position in the polycross nursery. It was therefore concluded that pollination was random. Ten of the 13 characters showed differences ascribable to the mother clones, indication thus being obtained that the test was sufficiently accurate to measure interclonal genetic differences.

1619 Hertzsch, W.
Gattungskreuzungen zwischen den Gattungen *Festuca* und *Lolium*. A. Kreuzungen zwischen künstlich hergestelltem autotetraploidem *Festuca pratensis* und autotetraploidem *Lolium multiflorum*. **(Intergeneric crosses between the genera *Festuca* and *Lolium*. A. Crosses between artificially produced autotetraploid *F. pratensis* and autotetraploid *L. multiflorum*).**
Züchter 1959 : **29** : 203–06.

Autotetraploid plants of *F. pratensis* and *L. multiflorum* were obtained by colchicine treatment and attempts were made to cross C_1 plants. The cross *L. multiflorum* x *F. pratensis* gave only a few poorly developed seeds; more seeds were obtained from the reciprocal cross but most of these were also poorly developed. From one of the seeds a healthy plant was raised. Before flowering the hybrid resembled *F. pratensis* more than *L. multiflorum*, both the leaves and tillering being similar to those of the mother species. The inflorescence of the hybrid formed an ear like that of *L. multiflorum* whereas diploid hybrids of the same cross have panicles like those of *F. pratensis*. In some small details the inflorescence of the tetraploid hybrid differed from that of the male parent. Pollen of the hybrid was 92% fertile. After open pollination the seed set was 37·1% but 14·6% of the seed was shrivelled and on selfing the set was 11·4%. A back cross to 4*n* *L. multiflorum* had a 40% seed set but the set was only 15% in a back cross to 4*n* *F. pratensis*.

1620 Cooper, J. P.
The stability of S23 perennial ryegrass during seed multiplication. I. Flowering behaviour and early seedling growth.
J. Brit. Grassl. Soc. 1959 : **14** : 183–90.

Studies were made of date of ear emergence, winter requirement and early seedling growth in stocks of S23 at different stages of multiplication and in stocks of Hunsballe, Irish and Kent. A slight shift towards earlier ear emergence was detected, amounting to 4·3 days in five generations. In the other characters, in spite of the considerable genetic variation in each stock, no regular changes were observed. The S23 stocks could readily be distinguished from Hunsballe and, less easily, from Irish, at the sixth leaf stage.

1621 COOPER, J. P.
Selection and population structure in *Lolium*. I. The initial populations.
Heredity 1959 : **13** : 317–40.

The populations studied were: *L. rigidum* 'Wimmera' from South Australia, an early-flowering winter annual; *L. perenne* 'Irish commercial', an early-flowering hay strain and a late-flowering pasture strain of perennial ryegrass, Kent indigenous. After autumn sowing the date of ear emergence was fairly uniform within each strain, Wimmera and Irish heading in early May and Kent at the end of May. The early strains showed greatest year-to-year variation, this being largely attributable to differences in spring temperature, once the critical photoperiod was reached. Most of the variation within each strain was genetic.

Spring sowing delayed heading in all strains. All Wimmera seedlings produced heads even when sown as late as mid April but variance in heading date was increased. In Irish and Kent, a progressive delay in sowing after January led to a regular decrease in the proportion of plants which headed. After the critical sowing dates of late March for Kent and mid-April for Irish, hardly any plants produced heads. Within each strain there was a considerable range in the speed with which floral induction occurred after a spring sowing.

In greenhouse tests it was found that Wimmera has no obligatory requirement for short day or low temperature before floral induction but in many plants heading was accelerated by either short day or cold treatment. Only a few Irish and Kent plants produced heads without short-day or low-temperature treatment and Kent had the greater requirement. Also differences were found within strains in the "winter requirement" for floral induction.

Using material that was fully induced, investigations were made on the photoperiodic requirement for floral initiation; leaf number before heading and date of ear emergence were recorded. All the Wimmera plants initiated heads in a nine-hour photoperiod but ear emergence was delayed. Some Irish plants formed heads in a nine-hour photoperiod but most required 11 hours or more and almost all the Kent plants required more than 11 hours. The results showed genetic variation within strains in respect of photoperiodic requirement. The relation between heading responses and the selective action of the environment is discussed. For Wimmera the chief selective factor is climatic, for the growing season is restricted by summer drought. The system of management of the seed crop in Northern Ireland has influenced the heading behaviour of Irish, and for Kent the effects of intensive grazing have been important.

1622 **Ryegrass with rust resistance.**
Agric. Res., Wash. 1959 : **8** : No. 2 : 5–6.

Promising rust-resistant strains of ryegrass have been selected from introduced Uruguayan material.

1623 PONOMAREV, A. N.
(Biological isolation of *Festuca sulcata* Hack. from *F. pseudovina* Hack).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **127** : 710–12. [Russian].

The absence of natural hybridization between the above species growing side by side in the province of Čeljabinsk is explained by differences in their flowering habits. *F. pseudovina* flowers normally 1–2 days earlier and, more important still, 1–1·5 hr. earlier in the day than *F. sulcata*.

1624 **Sterile forage sorghums make better silage.**
Crops & Soils 1959 : **12** : No. 2 : p. 23.

At the Nebraska Agricultural Experiment Station, sterile sorghums have been found better for ensilage than normal types because sorghum seed is too hard for cattle to use. One male-sterile hybrid, RS303F, appeared to transfer part of the nutrients, which in normal types are stored in the seed, to the stalk and leaves.

1625 RAMAN, V. S., CHANDRASEKHARAN, P. & KRISHNASWAMI, D.
Chromosome numbers in Gramineae.
Curr. Sci. 1959 : **28** : 453–54.

The following numbers are reported for some members of the Paniceae: *Urochloa reptans*, $n = 7$; *U. mosambicensis*, $n = 14$; *U. setigera*, $n = 18$; *U. panicoides*, $n = 24$; *Eriochloa procera*, $n = 18$; *Paspalidium geminatum*, $n = 9$; *P. flavidum*, $n = 27$; *Digitaria marginata*, *D. griffithii*, $n = 27$; *D. marginata* var. *fimbriata*, $n = 18$; *Setaria intermedia*, *S. verticellata*, $n = 27$; *S. splendida*, *S. holstii*, *S.* sp. (received as *S. superba*), $2n = 36$; and *S. woodii*, $2n = 18$. Pairing at meiosis was normal except in *U. mosambicensis* which frequently formed $10_{II} + 2_{IV}$.

1626 EBERHART, S. A. & NEWELL, L. C.
Variation in domestic collections of switchgrass, *Panicum virgatum* L.
Agron. J. 1959 : **51** : 613–16.

Study of collections made in Nebraska indicated scope for improvement of *P. virgatum* by selection. Rhizomatous decumbent growth, large seeds and early maturity characterized collections of the blue-green type from sandy soils in northern and western Nebraska, while high vegetative productivity, late maturity and resistance to rust (*Uromyces graminicola*) were found among samples of the green type from the fine-textured soils in the south-east. Some collections from the periphery of the sandy-soil areas contained plants with promising combinations of characters of both types. Heritability analyses based on variance components indicated that a significant proportion of the total variation was genetic.

1627 MCMILLAN, C. & WEILER, J.
Cytogeography of *Panicum virgatum* in central North America.
Amer. J. Bot. 1959 : **46** : 590–93.

The chromosome numbers of 124 clones representing 44 local populations collected in an area extending from Manitoba to Texas were determined, most of the clones being grown at Lincoln, Nebr. The majority of the earlier-flowering clones from the northern and western regions were tetraploid ($n = 18$). The later-flowering clones from Iowa were also predominantly tetraploid. Intrapopulational variation ($n = 18, 27, 36$) was found among the earlier-flowering clones from western Nebraska and later-flowering ones from the eastern part of the state. Material from Missouri, Kansas and Oklahoma also showed intrapopulational variation in chromosome number. None of the collections were diploid. The highest number was $n = 54$, in a clone from Oklahoma. No association was detected between plant height and chromosome number. Attention is drawn to the probable role of the complex breeding patterns, arising through cytological variation and the possible action of apomixis, in providing the genetic basis for the extensive distribution of the species in a diversity of habitats.

1628 JOSHI, A. B., PATIL, B. D. & MANCHANDA, P. L.
Chromosome numbers in some grasses.
Curr. Sci. 1959 : **28** : 454–55.

The following n numbers are reported: *Pennisetum subangustum*, 12, 16; *P. pedicellatum*, 24; *Ischaemum aristatum*, 12; *Sehima spathiflorum*, *S. sulcatum*, *Chrysopogon lancearius*, 10; *Iseilema laxum*, *I. wightii*, 14; *Panicum coloratum*, 9, 16, 18; and *Elyonurus hirsutus*, 9.

1629 BÖCHER, T. W.
Tetraploid and hexaploid *Trisetum spicatum* coll. A cytotaxonomical study.
Bot. Tidsskr. 1959 : **55** : 23–29.

Strains collected from Greenland were tetraploid ($2n = 28$) or hexaploid ($2n = 42$) and strains from Churchill, Manitoba, and Iceland were all hexaploid. Because of their distinct morphological characters and ecology and their more temperate distribution, the hexaploids are assigned to a distinct species, *T. molle*; hexaploid plants with pilose glumes, from Ivigtut, Greenland, are referred to the ssp. *pilosiglume*. The name *T. spicatum* is retained for the more widespread arctic tetraploid form.

1630 BOWDEN, W. M.
Chromosome numbers and taxonomic notes on northern grasses. I. Tribe Triticeae.
Canad. J. Bot. 1959 : **37** : 1143–51.

Chromosome numbers given are: *Elymus canadensis*, $2n = 28$; *E. cinereus*, $2n = 28$ and 56; *E. glaucus*, $2n = 28$; *E. innovatus* subsp. *innovatus*, $2n = 28$; *E. innovatus* subsp. *velutinus*, $2n = 56$; *E. wiegandii*, $2n = 28$; *Eremopyrum triticeum*, $2n = 14$; *Sitanion hystrix*, $2n = 28$; *Agrohordeum macounii* (*Agropyron trachycaulum* x *Hordeum jubatum*), $2n = 28$; *Agroelymus hirtiflorus* (*Elymus hirtiflorus* x *Agroelymus* sp.), $2n = 28$; and *Agroelymus ungavensis* (*Agropyron latiglume* x *Elymus mollis* subsp. *mollis* var. *mollis*), $2n = 28$.

1631 DOTZENKO, A. D. & STEGMEIER, W. D.
Pollen shedding in Russian wildrye grass.
Agron. J. 1959 : **51** : 594–95.

Observations on the duration and time of day of pollen production in *Elymus junceus* at Akron, Colo., are recorded.

1632 KNOWLES, R. P.
Performance of crested wheatgrass synthetics in advanced generations.
Agron. J. 1959 : **51** : 521–24.

Previously reported work is described in detail [cf. XXVIII, 1326]. In addition, it is noted that the superiority in yield of outcrosses of Syn. 2 over Syn. 2 itself provides further evidence of inbreeding depression in these synthetics.

1633 Dewey, D. R. & Lu, K. H.
A correlation and path-coefficient analysis of components of crested wheatgrass seed production.
Agron. J. 1959 : **51** : 515–18.

Phenotypic and genotypic correlation coefficients were calculated for all combinations between seed size, spikelets per spike, fertility, seed weight per spike, plant size and seed yield in 81 progenies studied in 1955 and 1957. The phenotypic and genotypic correlations agreed closely. The following high genotypic correlations were found: $r = -0{\cdot}706$ for fertility and seed size; $r = -0{\cdot}665$ for fertility and plant size; and $r = +0{\cdot}525$ for seed size and plant size. The use of the method of path coefficients to partition the correlation coefficients into their components showed that fertility and plant size were the factors exerting the greatest influence, both direct and indirect, on seed yield, while seed size and number of spikelets per spike were relatively unimportant. Since fertility and plant size are negatively correlated, selection must be based on a compromise between these characters if maximum seed yields are to be obtained.

LEGUMINOUS FORAGE PLANTS

1634 Scapaccino, G.
L'erba medica nel momento attuale. (**Lucerne today**).
Progr. agric., Bologna 1959 : **5** : 791–95.

A review is given of lucerne-breeding objectives and achievements in Italy, of the research stations dealing with this crop, and of improved varieties already available.

1635 Muljarčuk, S. A.
[**Hybrid lucerne (*Medicago glutinosa* x *M. coerulea*) and its utilization in agriculture**].
Bot. Ž. (Bot. J.), Moskva 1959 : **44** : 988–89. [Russian].

A few plants, thought to be natural hybrids of the above species, were found in a population of *M. glutinosa*; they are distinguished by greater height (80–100 cm.), leafiness, rhizome development, deep root systems and great persistency, the yield of forage being as good in the fifth year as in earlier years; the plants are resistant to both drought and frosts of −37–38° C.; they contain over 21% of protein in the dry matter, compared with under 15% in *M. sativa*. They have a tendency to lodge but this can be overcome by sowing with some other species such as timothy or sainfoin.

1636 **New Kansas alfalfa resists spotted aphid.**
Crops & Soils 1959 : **12** : No. 2 : p. 21.

In addition to being highly resistant to spotted aphid [cf. XXX, 482], Cody has shown resistance to bacterial wilt and has been less damaged by summer black spot and leaf spot than other aphid-resistant lucernes.

1637 Smith, O. F., Peaden, R. N. & Petersen, R. K.
Moapa alfalfa.
Circ. Nev. agric. Exp. Sta. 1958 : No. 15 : unpaginated.

Moapa was selected from strains of the variety African resistant to *Therioaphis maculata*. It is not winter hardy and only moderately resistant to bacterial wilt.

1638 Mann, A. P.
Harbinger medic—an early medic for the central and northern Mallee.
J. Dep. Agric. Vict. 1959 : **57** : 489–91.

A new selection of *Medicago littoralis*, Harbinger, has been released from the Mallee Research Station, Walpeup. It is an early-maturing variety, recommended for low-rainfall areas.

1639 Heyn, C. C.
Evolutionary problems in the genus *Medicago*.
Bull. Res. Counc. Israel : Sect. D. 1959 : **7** : p. 112. (Abst.).

Many species were studied at the Department of Botany, Hebrew University of Jerusalem, with respect to their morphology, cytology, mode of pollination, breeding system, fruit dispersal and geographical distribution. Sect. *Falcago* is considered to be the most primitive and sect. *Spirocarpos* to have originated from it. The generally accepted delimitation of *Medicago*, *Trigonella* and *Melilotus* is questioned. From a revision of possible intergeneric relationships, it became evident that "the bending of the pod, which is thought to be characteristic of *Medicago* should be regarded as a character which appeared a number of times in the course of the evolution of these three genera".

1640 Pedersen, M. W.
Effect of sodium 2,3-dichloroisobutyrate on alfalfa gametes.
Agron. J. 1959 : **51** : p. 573.

Lucerne treated with 0·5 or 1·0% concentrations of the above gametocide had about 90% good pollen as compared with the control and showed decreases in pod and seed set, the latter decreases being greater in flowers pollinated with normal pollen than in selfed flowers. There was also a marked reduction in flowering.

1641 Carnahan, H. L.
A comparison of cultural methods in evaluating alfalfa for the creeping-root character.
Agron. J. 1959 : **51** : 625–26.

In connexion with the development of creeping-rooted lucerne at the US Regional Pasture Research Laboratory, University Park, Pa., the possible effect of two cultural methods, cultivation and overseeding with associated grass, upon the root-spreading character in breeding nurseries was determined. The effect of cultural method and the interaction clone x cultural method were not significant.

1642 Zimmermann, K. F.
Die Versorgung mit Luzernesaatgut ist durch Züchtungs- und Anbaumassnahmen möglich. (**Supplying lucerne seed is possible through breeding and cultural measures**).
Dtsch. Landw., Berl. 1959 : **10** : 527–30.

At Müncheberg, attempts to improve seed yield by repeated selections have been successful and crossing selected strains has led to further improvement. The best strain in 1958 yielded almost twice as much as the test variety Bendeleben. No correlation was found between yield of seed and yield of green fodder. Individual plants with a very high seed yield (up to 100 g.) have often been found but the progeny of such plants never equals the mother plant in yield. It is suggested that considerable improvement might be attained by selecting such high-yielding individuals from a large number of plants, propagating the selections by cuttings and then allowing them to intercross. Other possible ways of improving lucerne are also discussed.

1643 Sinskaya, E. N.
Diploid and tetraploid species of wildgrowing alfalfa in the flora of the U.S.S.R.
Canad. J. Bot. 1959 : **37** : 1136–38.

Natural hybrids between diploid and tetraploid *Medicago* spp. in the USSR have always been found to be fertile tetraploids. When crossing species differing in chromosome number by means of an artificial mixture of pollen, fertile tetraploids (segmental allopolyploids) have been obtained instead of sterile triploids, which are usually produced by means of pollen from a single ♂ parent. For breeding, pollination of wild diploid lucerne by a pollen mixture from different species and cultivars of *M. sativa* is considered to be the best procedure. Information is given on the distribution and chromosome numbers of the wild species so far investigated and on whether use has been made of them in breeding [cf. XXVI, p. 323]. Speciation is occurring in two ways: without change in chromosome number, as in the phylogenetic series *M. hemicycla* ($2n = 16$) → *M. coerulea* → *M. trautvetteri*, or with alteration in chromosome number accompanied by few or no transitional forms, as in the series *M. hemicycla* → *M. praesativa* ($2n = 32$). Hybridization between diploid species may be prevented by a barrier due to the occurrence of a tetraploid species between their areas of distribution.

1644 Stefanov, B.
(**Possibilities of utilizing some perennial leguminous plants for forage**).
Izv. Inst. Gorata (News Inst. For.)/Bull. Inst. For., Sofija 1959 : **4** : 53–80. [Bulgarian].

Mention is made of local forms of *Medicago sativa* characterized by productiveness, drought resistance and high nutritive value. They are thought to provide a good source for selection, as they are better adapted to Bulgarian climatic and soil conditions than introduced cultivars. Experiments on breeding hybrid lucerne showed that (1) *M. varia* can only be obtained from *M. falcata* ♀ x *M. sativa* ♂ and (2) the later selfed generations of *M. varia* give plants morphologically similar to *M. sativa*.

1645 Adams, M. W. & Semeniuk, G.
The use of population subdivision in effecting a stratification of gene frequencies for reaction in alfalfa to *Pseudopeziza medicaginis*.
Agron. J. 1959 : **51** : 608–10.

Thirty-six plants, each having a score of 1·0 (no infection, on a scale of 1–9) with respect to *Ps. medicaginis*, were randomly selected from the resistant class of a larger population. The plants were allotted at random to 12 groups of 3 plants each. The total population resulting from random intercrossing within the groups had a mean score of 1·32 for reaction to the pathogen, as against 2·06 for the mean of the population from which the parents were taken. This was interpreted as indicating that individual differences were still highly heritable although no additive genetic variance was detectable among families in the parental population. The twelve groups differed significantly among themselves in mean reaction. Since subdivision of a population is equivalent to inbreeding in the total population and this inbreeding leads to slightly increased variance between groups, the primary cause of the dispersion of the group means is believed to be chance operating at the time the plants were allotted randomly to the groups.

1646 Ward, C. H.
The detached-leaf technique for testing alfalfa clones for resistance to black stem.
Phytopathology 1959 : **49** : 690–96.

The detached-leaf technique was found reliable for testing resistance to *Phoma herbarum* in lucerne. The variety Narrangansett consistently showed the highest resistance, while du Puits was the most susceptible.

1647 Barker, K. R. & Sasser, J. N.
Biology and control of the stem nematode, *Ditylenchus dipsaci*.
Phytopathology 1959 : **49** : 664–70.

The host range was investigated in two North Carolina populations of *D. dipsaci* collected from Wake County and Haywood County. Three lucerne nematode populations (Wake County, Haywood County and Nevada) and one teasel nematode population were used to investigate population differentiation. Lucerne nematodes did not breed on teasels or teasel nematodes on lucerne. While teasel nematodes were generally slightly larger than the other three no anatomical differences were found between any of the populations. The garden pea variety Wando proved to be a good differential host, being susceptible to the Wake County and Nevada populations but resistant to the Haywood County population.

Several lucerne varieties were tested for resistance to Wake County nematodes and Lahontan was found to be the most resistant.

1648 Goplen, B. P., Stanford, E. H. & Allen, M. W.
Demonstration of physiological races within three root-knot nematode species attacking alfalfa.
Phytopathology 1959 : **49** : 653–56.

The virulence of twenty California collections of root-knot nematodes (*Meloidogyne* spp.) was tested on strains of five varieties of lucerne chosen for their varied genetic backgrounds and expected reactions to root knot. These were Africa, M8 (from Hilmar), M9 (from Vernal), JR7 (from California Common) and Caliverde. Three races were found in *M. incognita acrita*, two in *M. javanica javanica* and two in *M. hapla*. Only the Vernal selection M9 showed resistance to all collections.

1649 Nielson, M. W. & Curie, W. E.
Effect of alfalfa variety on the biology of the spotted alfalfa aphid in Arizona.
J. econ. Ent. 1959 : **52** : 1023–24.

The effects on *Therioaphis maculata* of two resistant varieties, Moapa and Lahontan, are compared with those of two susceptible varieties, Chilean 21–5 and African.

On resistant plants the aphids take longer to reach maturity but longevity is not affected. Nymphal mortality is very much higher on resistant plants. Of those which reach maturity the proportion that produce progeny is higher on susceptible plants and their reproductive rates are greater.

1650 **Zia alfalfa resists spotted aphid in Southwestern variety trials.**
Crops & Soils 1959 : **12** : No. 1 : p. 21.

[Cf. XXIX, 3969].

1651 Hackerott, H. L. & Harvey, T. L.
Effect of temperature on spotted alfalfa aphid reaction to resistance in alfalfa.
J. econ. Ent. 1959 : **52** : 949–53.

The effect of temperature was studied on the development and reproduction of *Therioaphis maculata* on lines 78, 247 and BS10 of Buffalo, these being respectively resistant, intermediate and susceptible.

Data obtained over the range 60–90° F. show that resistant and intermediate plants inhibit normal aphid development at all temperatures although this effect is relatively greater at high temperature than at low.

On resistant plants, adults and nymphs react differently, adults being able to survive longer than nymphs. The length of the reproductive period of the aphid and the rate of reproduction both vary with temperature and degree of resistance.

A comparison between seedlings from resistant and susceptible plants at 60° and 80° F. showed that in both cases the seedlings withstood aphid infestation better at the lower temperature.

1652 Ivanov, Ja. A.
(A clover variety valuable for Kirgizia).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 1 : 68–70. [Russian].

Frunze 1 was selected from a wild population comprising *Trifolium pratense* and *T. arvense* at the Kirgizian Agricultural Institute. It is hardy, resistant to drought, has a tall habit without lodging, is superior to the standard variety Čujskij in resistance to pests and diseases, and is characterized by rapid growth in the spring and after cutting.

1653 MATTSSON, A.
Olika rödklöverstammars odlingsvärde i Östergötland. (**The cultural value of different strains of red clover in Östergötland**).
Sverig. Utsädesfören. Tidskr. 1959 : **69** : 251–74.

Among 16 local strains tested at five localities during 1925–58, Sörby-Okna was best in yield and resistance to *Sclerotinia trifoliorum* and *Ditylenchus dipsaci*. Seven commercial strains were also tested, among which Merkur averaged 1% more than Sörby-Okna in green matter yield and showed even greater superiority under attacks of the above pathogens. The tetraploids Ulva, Rea and Sv034 yielded more than diploid Merkur, particularly in second-year leys, Ulva being best.

1654 RASMUSSEN, F.
Stammeforsøg med rødkløver 1953–1957. (**Strain trials of red clover, 1953–57**).
Tidsskr. Planteavl 1959 : **63** : 613–33.

Data are given on the yield, dry-matter content, protein content, earliness and disease resistance of seven early and nine semilate strains tested in Denmark. As a result of the trials, six of the early and five of the semilate clovers have been recognized as first-class strains.

1655 SCHWEIGER, W.
Gegenseitige Beeinflussung der Samenleistung von benachbartem diploiden und tetraploiden Rotklee. (**The mutual influence of neighbouring diploid and tetraploid red clover on seed production**).
Züchter 1959 : **29** : 225–29.

Diploid and tetraploid plants were grown together in various proportions. The seed yield of the tetraploids was depressed by the presence of even a small proportion of diploids and the yield decreased in a linear fashion as the proportion of diploids was increased. However the seed yield of the diploids was hardly affected by the tetraploids; only when the proportion of tetraploids was very high, did the diploids show some depression in yield. The decrease in yield of the tetraploids is thought to be the result of fertilization by haploid pollen; this results in the production of triploid embryos which abort. It is emphasized that in testing tetraploids for seed production, the plants should be grown well away from diploids; the separating distance should be at least 8 m.

1656 UMÆRUS, M. & ÅKERBERG, E.
Till frågan om typ- och stambeteckning hos rödklöver. (**On the question of the designation of types and strains in red clover**).
Sverig. Utsädesfören. Tidskr. 1959 : **69** : 111–26.

The types (1) early, (2) medium late and (3) late have generally been regarded in Sweden as being distinct in regeneration ability, winter hardiness and parasite resistance but it now appears that the chief distinguishing characteristic is day-length reaction, and that, especially in recently developed red clovers, strains of similar photoperiodic type may differ markedly in other agronomically important characteristics.

1657 **Long live red clover.**
Agric. Res., Wash. 1959 : **8** : No. 4 : 8–9.

Lack of persistence in some areas, as in Kentucky, has been found to be due to depletion of food reserves after mowing or grazing through the effect of high temperature. Clones capable of transmitting persistence are being selected at the Kentucky Agricultural Experiment Station, prior to intercrossing to form a synthetic with a more dependable perennial habit than varieties at present available. With the aid of information on the relationship between temperature and survival, selections are screened for tolerance of high temperature. They are also screened for resistance to mildew and viruses.

1658 KOZICKA-NOWAKOWA, E.
Samozapylenie koniczyny czerwonej (*Trifolium pratense* L.). [**Self pollination in red clover (*T. pratense* L.)**].
Hodowla Roślin Aklimatyz. Nasiennictwo 1958 : **2** : 107–22.

In studies conducted in Poland during 1951–57, artificial self pollination resulted in plants which readily underwent further selfing. Seed number and seed size in selfed plants did not show regular differences from values obtained after insect pollination, but the seeds of the selfed material had an appreciably longer dormancy period.

1659 KOLOMYCEV, G. G.
[**Multifoliate red clover (*Trifolium sativum* Krome)**].
Bot. Ž. (Bot. J.), Moskva 1959 : **44** : 846–48. [Russian].

Several populations were found in which some of the plants bore leaves with 4–5 leaflets. When two plants in which 20% of the leaves had supernumerary leaflets were crossed, the progeny had them in as many as 75% of the leaves. One of the parents had a winter habit and the other a spring and some of the F_1 plants flowered sooner than the early parent; these were the only ones that had no supernumerary leaflets. In the following year the plants were grown in fertile ground and all produced supernumerary leaflets in varying degrees, some leaves having up to 7 leaflets. The phenomenon was frequently associated with fasciated stems.

1660 HANSON, E. W.
Relative susceptibility of seven varieties of red clover to diseases common in Wisconsin.
Plant Dis. Reptr. 1959 : **43** : 782–86.

The relative susceptibility of several varieties to the following pathogens has been observed: *Erysiphe polygoni*, *Kabatiella caulivora*, *Stemphylium sarcinaeforme*, *Cercospora zebrina*, *Uromyces trifolii*, *Ascochyta imperfecta*, *Fusarium* spp. and various viruses. The variety Lakeland showed the highest resistance to *Erysiphe* and together with Dollard to *Kabatiella*. All varieties were susceptible to the other pathogens, but Lakeland was least so to *Ascochyta* and the virus complex, and Penscott to *Stemphylium* and *Cercospora*.

1661 BROWN, E. B.
A broad red clover resistant to stem eelworm.
Plant Path. 1959 : **8** : p. 124.

A stock noticed by chance in Hertfordshire, England, has shown an unusually high degree of resistance to *Ditylenchus dipsaci*, not only in the original field but also in pot tests, and is now undergoing trial at the Plant Breeding Institute and National Institute of Agricultural Botany, Cambridge.

1662 DIACHUN, S. & HENSON, L.
Some clover clones resistant to mosaic disease.
Kentucky Fm. Home Sci. 1959 : **5** : No. 3 : 3, 6.

Three clones of red clover reacting to bean yellow mosaic by formation of local necrotic lesions have been isolated at the Kentucky Agricultural Experiment Station. Their lack of leaf marking serves as an aid in identifying them. The clones are expected to be of value in breeding.

1663 RASMUSSEN, F.
Forsøg med stammer af hvidkløver 1950–57 og 1941–47. (**Trials of strains of white clover, 1950–57 and 1941–47**).
Tidsskr. Planteavl 1959 : **63** : 634–57.

On the basis of the trial data presented [cf. XXVIII, 4340], six strains from the later series are recognized for use in shorter leys and three of these also for use in permanent grass. In the earlier series [cf. XX, 983], five strains were recommended for permanent grass only, one for leys only and one for both purposes.

1664 DAVIES, D. R. & WALL, E. T.
Separation by gamma-irradiation of two elements at the V^{by} locus in *Trifolium repens*..
Nature, Lond. 1959 : **184** : 1957–58.

V^{by}, one of the 11 alleles known to occur at the above locus for leaf marking, results in a broken-white V surmounted by a yellow tip. Clones heterozygous for V^{by} and *v* (absence of marking) were exposed to radiation at Wantage Radiation Laboratory, UK Atomic Energy Authority. The mutants arising through this treatment of the somatic tissue included phenotypes in which the whole mark, the white V or the yellow tip was lost. The separation of the two phenotypic characteristics of V^{by} is regarded as evidence of structural complexity of the locus. Possibly all three types of mutant phenotype were associated with deletions. The mutants proved to be chimeras, the flowers being derived from normal tissue. Since the V^{by} mutants may offer a means of solving the problem of ensuring seed authenticity, further work is being undertaken, in which seeds heterozygous for V^{by} and *v* are being irradiated in an attempt to produce mutant tissue which is not chimerical.

1665 DONALD, C. M.
The production and life span of seed of subterranean clover (*Trifolium subterraneum* L.).
Aust. J. agric. Res. 1959 : **10** : 771–87.

The early-flowering variety Dwalganup differs from three other varieties tested in the persistence of more of its seed into second and subsequent years. A genetic difference is suggested.

1666 DONNELLY, E. D. & LANGFORD, W. R.
Warrior vetch—a new variety for Alabama.
Leafl. Ala. agric. Exp. Sta. 1959 : No. 62 : Pp. 4.

Further information is given on *Vicia sativa* 'Warrior', a composite of five lines selected for seed and herbage production and cold tolerance [cf. XXIX, 1667].

1667 Moga, I.
Contribuţii la studiul comportării sparcetei in condiţiile cîmpiei Bărăganului.
(**Contributions to the study of the behaviour of sainfoin under the conditions of the plain of Bărăgan**).
Probl. Agric., Bucureşti 1958 : **10** : No. 6 : 36–42.

A comparative trial of four varieties at Marculeşti, Rumania, in which data were collected on yield, resistance to frost, drought and diseases, and chemical composition, showed that Bărăgan 2 was the best sainfoin for the above area.

1668 Korovin, S. E.
(**A new form of sweet clover**).
Bjull. glavnogo Bot. Sada (Bull. princ. Bot. Gdn.), Moskva-Leningrad 1959 : No. 34 : 78–79. [Russian].

A tall, vigorous form free from pubescence, found in the Caspian area and thought to be a natural hybrid of *Melilotus polonicus* x *M. altissimus*, is described; it is considered promising for forage purposes.

1669 Bálint, S.
Sárgavirágú csillagfürt-fajták érzékenysége a keskenylevelű meddőségre.
(**Susceptibility of yellow lupin varieties to narrow-leaf sterility**).
Mosonmagyar. Mezőgazdaság. Akad. Közl., Bp. 1958 : **3** : 16–24; from Hungar. agric. Rev. 1959 : **8** : No. **3** : p. 9. (Abst.).

Intervarietal differences in susceptibility to the narrow-leaf disease [cf. XXIX, 1678] were detected among 24 varieties tested in 1956 and 35 tested in 1957,but no fully resistant varieties were found. The degree of sterility associated with the narrow-leaved condition varied. Strain 102 and Gyulatanya 84 showed some resistance. Although early varieties generally escape infection, it is thought that sufficient variation in susceptibility occurs for it to be possible to breed for resistance without necessarily increasing earliness.

1670 Malik, H. C. & Batra, P. C.
Studies with fenugreek (*metha*) in the Punjab.
Indian J. agric. Sci. 1958 : **28** : 157–65.

A provisional classification scheme is outlined by which Punjab varieties of *Trigonella foenum-graecum* can be divided into nineteen groups. These are described in the paper. Yield trials showed groups 8 and 11 to be the most valuable commercially.

1671 Danjo, T., Kozaki, M., Katayama, Y. & Nagatomo, T.
(**Studies on the technique of cultivating forage crops**).
Miyazaki Daigaku Nogakubu Kenkyu Jiho/Bull. Fac. Agric. Univ. Miyazaki 1958 : **4** : No. 1 : 69–77. [Japanese].

Astragalus sinicus. Strains collected from all over Japan were compared to ascertain their forage production when grown in either rice fields or dry fields, when grown with or without fertilizer, and when sown at various dates. Data are also provided, from pot experiments, on the comparative resistance of the strains to waterlogging.

1672 Ognev, I. M.
(**Serradella in White Russia**).
Zemledelie (Agriculture) 1959 : No. 1 : 71–74. [Russian].

Mention is made of trials of land varieties such as Stolpcovskaja Mestnaja [Local Stolpcy] and Skidel'skaja Mestnaja [Local Skidel'] which outyield the serradella cultivars bred at the Novozybkov Research Station. Stolpcovskaja Mestnaja produced 30·1 c. more green matter per ha. in four years than the cultivar Srednepozdnespelaja 2942 [Midlate 2942] and 34·6 c. more than Skorospelaja 3587 [Early 3587] in trials at Luninec. Skidel'skaja Mestnaja yielded 171·7 c. green matter and 5·5–7·2 c. seed per ha. in 1955 at Volkovyssk. The two land varieties have leafiness of the order of 42·8–57·2% and growth periods of 107–116 days. Stolpcovskaja Mestnaja is referred to as fairly resistant to pests and diseases.

ROOTS AND TUBERS

1673 Jähnl, G.
Ergebnisse der Rübenversuche des Jahres 1958. (**Results of the root trials of the year 1958**).
VersErgebn. BundesVerAnst. alpenländ. Landw., Gumpenstein 1959 : No. 48 : Pp. 49. (Mimeographed).

Varietal differences in yield of tubers and foliage and in dry matter, protein and sugar content are reported for mangels, sugar beets, swedes and turnips. Of the mangels Corona, Kirsches Koloss [Kirsch Colossus], Zentaur [Centaur] and Ursus gelb [Ursus Yellow] gave high yields of roots and Corona, Zentaur and Rosa Beta gave the best yields of dry matter. Rosa Beta yielded most foliage. Of the sugar beets, Hilleshög polyploid varieties and Dobrovice N gave the highest yields of sugar. Maribo PA3, Beta 1 and Janasz AJ3 produced most foliage.

In Gumpenstein, Endress Frankenstolz outyielded other swedes in roots and dry matter, but in Admont Weisse Schmalz [White Schmalz] was the best variety. The highest yielding turnips were Steirische Vollrunde [Styrian Completely Round] and Steirische Walze.

1674 **Varieties of fodder beets and mangels.**
Fmrs'. Leafl. nat. Inst. agric. Bot. 1959 : No. 6 : unpaginated.

Varieties are listed together with tabulated information on root characters, relative ease of hand lifting, cleanliness, top size and percentage of bolters obtained during the 1955–58 trials conducted by the National Institute of Agricultural Botany, Cambridge, England.

1675 MULLER, A. & CASTRONOVO, A.
Tipo de parcela adecuado para ensayos de campo con nabo "de Vertus". (**Plot type suitable for field trials of the Vertus turnip**).
Rev. Invest. agríc., B. Aires 1959 : **13** : No. 1 : 47–55.

In this uniformity trial with the Vertus turnip, 280 plots 0·70 x 1·00 m.^{2} in size were harvested over an area of 8·40 x 24·00 m.^{2} and the individual yields grouped to form plots differing in size and shape. Analysis of the results showed that plots of 0·70 x 4·00 m.^{2} with ten replicates or of 0·70 x 8·00 m.^{2} with six replicates allow mean differences of the order of 10% of the general mean to be detected. Other plot types were less efficient.

1676 CASTRONOVO, A. & MULLER, A.
El uso de la covariancia en ensayos de campo con nabo "de Vertus". (**The use of covariance in field trials of the Vertus turnip**).
Rev. Invest. agríc., B. Aires 1959 : **13** : No. 1 : 57–62.

In a comparison of the variance and covariance methods of analysis, using the uniformity trial data referred to in the preceding abstract, the variation in relative number of plants per plot decreased with increasing plot size, particularly with increasing number of rows, and had a significant effect upon yield in the smaller plots. Even in the small plots, the effect of the regression of yield on stand was slight in comparison with the natural variation of the material, so that the gain in precision through the use of covariance was small in the small plots and negligible in the large. The greatest gain was for the plot sizes recommended [1675], in each of which covariance analysis allowed the number of repetitions to be reduced by one. The use of covariance analysis is therefore not regarded as being normally worth while in this type of experiment.

1677 HORVÁTH, I.
A nemesített Őrségi 12. tarlórépa termesztése. (**The production of the improved turnip Őrseg 12**).
Agrártudomány 1959 : **11** : 29–32.

The above variety, developed at the South-western Trans-Danubian Agricultural Experimental Station in Hungary, is early, productive, fine fibred and tolerant of frost and has a high dry matter content of 7–8%, a low mustard-oil content and smooth, round roots.

1678 TJALLINGII, F.
Fysiologische specialisatie van de knolvoetschimmel en het kweken van resistente stoppelknolrassen. (**The physiological specialization of the club-root fungus and the breeding of resistant turnip varieties**).
Tijdschr. PlZiekt. 1959 : **65** : 66–67. (Abst.).

At least five races of the club-root pathogen have been found attacking turnips. Two strains of Mommersteeg and one of Barenza, hitherto resistant to the most common race, are susceptible to three of the new races, the Belgian varieties Waaslander and Meetjeslander are susceptible to two new Netherlands races, and all the commercial Netherlands varieties as well as many other lines are attacked by a new Belgian race. The new races appear to be spreading and should be taken into account in breeding for resistance.

1679 **Varieties of swedes.**
Fmrs'. Leafl. nat. Inst. agric. Bot. 1959 : No. 7 : unpaginated.

Tabulated information is given on the yield, dry-matter content, neck length and top size of a number of light-purple and green-skinned swede varieties tested by the National Institute of Agricultural Botany, Cambridge, England, during 1953–58.

1680 **(At a session of the Lenin Agricultural Academy).**
Kartofel' (Potato), Moskva 1959 : No. 1 : 57–58. [Russian].

Breeding potatoes for earliness, high protein content and resistance to insects and diseases was among the topics discussed at a recent conference on horticulture and viticulture in Moscow. Brief mention is made of the papers read by Kameraz [cf. 1688] and by Al'smik, who discussed breeding potatoes for earliness in White Russia. Al'smik's experiments suggest that more vigorous hybrids are obtained by crossing midseason varieties with early ones than from early x early crosses. A thousand or more hybrids from each set of components are needed for selecting the right kind of hybrids, because of the very extensive segregation of potato hybrids.

1681 Forsøg med middeltidlige kartoffelsorter 1955–57. (**Trials of medium-early potato varieties, 1955–57**).
Tidsskr. Planteavl 1959 : **63** : 521–24.

Data on yield, dry matter content, tuber size, earliness, incidence of disease, cooking quality and keeping quality are presented for eight varieties tested in Denmark.

1682 Cărăusu, D., Oprişor, N. & Tomozei, I.
Rezultatele experienţelor cu soiuri de cartofi în regiunea de silvostepă de la Iezăreni-Iaşi. (**Results of experiments with potato varieties in the woody-steppe region of Iezăreni-Iaşi**).
Stud. Cercet. şti., Biol. Şti. agric. Iaşi 1957 : **8** : No. 1 : 111–18.

Varietal tests conducted during 1953–55 are reported, information being provided on tuber yield, incidence of virus infestation and degeneration, and dry-matter and starch content.

1683 Dimitrescu, M.
Contribuţii la studiul soiurilor de cartof la Staţiunea experimentală legumicolă Ţigăneşti. (**Contributions to the study of potato varieties at the Ţigăneşti Vegetable Experimental Station**).
Anal. Inst. Cerc. agron. Romîn. 1957 (1958) : **25** : No. 6 : 317–29.

Varietal trials involving both spring and summer planting are reported. Data are provided on yield and content of starch, protein and ascorbic acid.

1684 Isleib, D. R. & Wheeler, E. J.
Evaluation of potato varieties and seedlings in Michigan, 1955–58.
Quart. Bull. Mich. agric. Exp. Sta. 1959 : **42** : 146–53.

The yield and culinary quality of thirty varieties of potato were investigated on mineral and organic soils. Huron, Russet Rural, Kennebec and Sebago gave good performances on both soils. When selected for crisp manufacture, Merrimack, Cherokee and Kennebec proved most satisfactory.

1685 Rabkina, N.
(**The eminent Russian plant breeder Efim Andreevič Gračev**).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1959 : No. 2 : 74–75. [Russian].

This biography of Gračev (1826–1877) includes brief descriptions of his potato varieties.

1686 (**A glorious jubilee. On the occasion of the 70th birthday of I. A. Veselovskij**).
Kartofel' (Potato), Moskva 1959 : No. 1 : p. 56. [Russian].

Several potato varieties bred by Veselovskij and his colleagues at the Leningrad Agricultural Institute are listed. They include such standard varieties as Ėpron, Imandra, Murmansk and Igarka.

1687 Grun, P.
Cytoplasmic differentiation in the evolution of isolating barriers in *Solanum*.
Genetics 1959 : **44** : p. 514. (Abst.).

A study of crosses involving nine species of the series *Tuberosa* and *Commersoniana* revealed the occurrence of a low but highly significant reduction in seed set in interseries crosses as compared with intraseries crosses. "The establishment of these barriers, in some cases, involved separate mechanisms specific to one or the other sex. Evidence is presented for existence of a total of four independent mechanisms reducing seed set in interseries crossings: male and female mechanism reducing berry set, and male and female mechanism reducing seed set per berry. The evidence is interpreted as showing the existence of a cytoplasmic interaction resulting in either gametic or zygotic selection. In either case, it seems likely that the hybrid individuals grown were not a random, but a selected sample of combinations of genes of the parent species."

1688 Kameraz, A. Ja.
(**The prospects of utilizing wild potato species in breeding**).
Kartofel' (Potato), Moskva 1959 : No. 1 : 38–43. [Russian].

Wild and primitive species and forms of potato from the Institute of Plant Industry valuable for breeding varieties resistant to frost, *Phytophthora*, *Synchytrium*, *Oospora*, southern wilting, *Alternaria*, *Streptomyces scabies*, *Spongospora subterranea*, black leg, ring rot, leaf roll, viruses X, Y and A, *Leptinotarsa*, *Epilachna* and *Heterodera* are listed. Also listed are forms useful in breeding varieties rich in starch or protein and varieties with a short dormant period which can be lifted early and then sown again in the same year. Some of the practical results of interspecific hybridization are briefly mentioned. They include a few cultivars possessing varied degrees of resistance to *Phytophthora*, *Synchytrium*, leaf roll and virus X and others that have a high starch content or short growth or dormant periods.

1689 ORDOJAN, S. O.
(Biological and morphological variability of a variety).
Kartofel' (Potato), Moskva 1959 : No. 1 : 44–45. [Russian].

The potato variety Lorh showed morphological and biological changes upon transfer from north Russia to Armenia. Changes occurred in the pigmentation of the tubers and stems, shape of leaves and stems, and growth and dormancy periods. When sown in the Ararat plain in summer, Lorh formed and ripened berries.

1690 HOWARD, H. W.
Experiments with a potato periclinal chimaera.
Genetica 1959 : **30** : 278–91.

The origins of the tissues found in potato tubers and of tuber pigmentation are considered. Breeding, eye-excision and X-ray experiments on Red King are then described in detail, the results being explained on a periclinal-chimera basis [cf. XXIX, 1703]. An estimate is given for the mutation rate of King Edward to Red King. It is suggested that the production of white tubers with pink splashes round the eyes in King Edward depends upon two closely linked genes, one for periderm pigmentation and the other for localization of the pigment around the eyes, acting in conjunction with the basic gene *D* for pigmentation. Difficulties in explaining the occurrence of bud sports in varieties having tuber pigmentation in the outer cortex are discussed.

1691 LINNIK, G. N.
Cauzele degenerării cartofului. **(Causes of the degeneration of the potato).**
An. Romîno-Soviet. : Ser. Agric.-Zooteh. 1958 : **12** : No. 2 : 66–74.

[Cf. XXVIII, 682].

1692 Nouvelles variétés de pommes de terre en Pologne. **(New potato varieties in Poland).**
Pomme d. Terre franç. 1959 : **22** : No. 240 : 16–21.

Thirty varieties, ranging from very early to very late, are listed together with brief descriptions and details of parentage and disease resistance.

1693 Variedades nacionales de patata. **(National potato varieties).**
ASPAS, Madr. 1959 : No. 32 : 6–8.

The varieties Duquesa, Goya [XXVII, 3161], Olalla [XXVI, 2501], Turia and Victor [XXVII, 3161] are described. Duquesa [Duchess], from Blanca temprana [Early White] x Erdgold [Earth Gold], is a very productive, early or semiearly variety with yellow flesh and good cooking quality. Turia (Blanca de Cernégula [Cernégula White] x Regina) has pink skin and yellowish-white flesh, is semiearly, yields quite well and resists virus X. All were developed at the Spanish Potato Breeding Station.

1694 IVANOVA, N. E.
(Varietal field testing station introduces new varieties).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 1 : 47–49. [Russian].

S437, a high-yielding, early, wart-resistant potato variety of unspecified origin, has been produced at the Podol testing station.

1695 M., J.
Avenir, une nouvelle variété de pomme de terre. **(Avenir, a new potato variety).**
Rev. rom. Agric. 1959 : **15** : p. 88.

This variety, originating from a cross of D21 with Katahdin, has been available since 1957 in Holland where it was bred [cf. XXVIII, 683]. In Switzerland it has outyielded Bintje and shown considerable resistance to drought. Avenir [Future] is immune to wart and only slightly susceptible to scab.

1696 VELICAN, V. & FELECAN, V.
Soiuri noi de cartof create la Staţiunea de Cercetări Agronomice Cluj. **(New potato varieties created by the Cluj Agricultural Research Station).**
Anal. Inst. Cerc. agron. Romîn. 1957 (1958) : **25** : No. 6 : 239–52.

Three new varieties suitable for Transylvania and northern Moldavia are described. Ardeal (Cluj 43–30), obtained by selfing Merkur, is a midlate variety with yellow tubers and pale-yellow flesh; Napoca (Cluj 45–10), derived similarly, is a late variety with yellow tubers and flesh; while Someşan (Cluj 47–18), obtained by crossing Rubingold [Ruby Gold] with an unknown variety, is a midlate variety with pink tubers and yellow flesh. Trials involving these and standard varieties at various Rumanian research stations are described.

1697 **Bounty potato for Nebraska.**
Crops & Soils 1959 : **12** : No. 1 : p. 21.

Bounty, released by the Nebraska Agricultural Experiment Station, has given an average yield of 649 bushels per acre on irrigated land, the yields from dry land being 179 and 289 bushels in western and eastern parts of the state respectively. The tubers are red, large and oblong. Bounty has good cooking quality and is suitable for crisps; it is said to be mealy.

1698 **Blanca potato released in Colorado.**
Crops & Soils 1959 : **12** : No. 2 : p. 21.

Blanca has good cooking quality and also makes good crisps. It has smooth, white-skinned tubers and is highly resistant to scab. This variety produces a high percentage of No. 1 potatoes. It was developed by the US Department of Agriculture and the Colorado Agricultural Experiment Station.

1699 Engel, K.-H. & Möller, K.-H.
Frühdiagnose auf Reifezeit an Kartoffelsämlingen. (**Early diagnosis of maturity period in potato seedlings**).
Züchter 1959 : **29** : 218–20.

At Gross-Lüsewitz, it was found that 80% of seedlings showing long stolons when they are ready for potting have either early or medium-early maturity.

1700 Lipińska, J. & Glück, J.
Wstępne badania nad żywotnością pyłku ziemniaka. (**Preliminary investigations on the vitality of potato pollen**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1958 : **2** : 335–50.

Pollen tube growth in different culture solutions was measured in varieties of *Solanum tuberosum*, in several hybrids from *S. tuberosum* x *S. commersonii* and in a number of other species. The results were in good agreement with observations on pollen germination in field pollinations, 52 different combinations of which were studied. The longest tubes occurred in the hybrids, *S. chacoense* and *S. andigenum*, and the shortest in *S. tuberosum*, *S. parodii* and *S. polyadenium*. In the pollination studies, *S. tuberosum* pollen showed 6·1% germination on *S. tuberosum* and 4·8% on the hybrids, while *S. andigenum* pollen showed 19·8% on *S. tuberosum* and 10·7% on the hybrids.

1701 Świeżyński, K.
Prosty sposób pobudzenia ziemniaków do kwitnienia i owocowania. (**A simple method of inducing flowering and fruiting in potatoes**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1958 : **2** : 123–35.

The following stages are involved: (1) tubers from which all but one vigorous sprout have been removed are planted in boxes with sand; (2) when the plants are 10 cm. high they are transplanted to the field, all stolons being removed and the base of the plants surrounded with sand; (3) at a plant height of 30 cm. the sand, the mother tuber and the stolons are removed and the plants tied to sticks; (4) during the course of the season stolons and superfluous green shoots are periodically removed.

1702 Pavel, I. G.
Sporirea și menţinerea productivităţii soiurilor de cartof în cîmpia Moldovei, prin metoda plantărilor de vară. (**The augmentation and maintenance of the productivity of potato varieties in the Moldavian plain by the method of summer planting**).
Anal. Inst. Cerc. agron. Romîn. 1957 (1958) : **25** : No. 6 : 49–68.

Summer planting usually resulted in reduced yields, but when seed tubers so obtained were planted in spring, the yields obtained exceeded that from plants grown from normally produced seed tubers. The amount of increase depended upon the variety, reaching 71% in the case of Viola.

1703 Lapwood, D. H.
'Field resistance' and potato blight (*Phytophthora infestans*).
Trans. Brit. mycol. Soc. 1959 : **42** : p. 397. (Abst.).

Investigations were carried out during 1956–58 on the field resistance of King Edward, Up-to-Date, Majestic and Arran Viking, which show increasing haulm resistance in this order. Information is given on factors affecting differences in rates of foliage infection and destruction of infected foliage. Disparities between varieties were greater in susceptibility of stem and petiole than of the lamina, Up-to-Date and Kind Edward being particularly susceptible to axillary inoculation.

1704 Toxopeus, H. J.
Notes on the inheritance of field resistance of the foliage of *Solanum tuberosum* to *Phytophthora infestans*.
Euphytica, Wageningen 1959 : **8** : 117–24.

The incidence of *Ph. infestans* on the leaves of about 2000 seedling clones from 35 cross combinations was studied. Among those without the hypersensitivity genes R_1 and R_3, plants with two susceptible parents were nearly all susceptible, while those with two highly resistant parents showed good resistance and some transgression. A tendency towards resistance was found among crosses between moderately and highly resistant plants and towards susceptibility in crosses between highly resistant and highly susceptible plants. Resistance in this material appears to be governed by a number of minor genes. In the material carrying R_1 and R_3, minor genes for field resistance were also present. The possibility of combining hypersensitivity genes with an extensive set of minor genes for field resistance is discussed; *S. demissum* is regarded as a probably useful source of minor genes as well as of major genes.

1705 KEDAR, N.
The peroxidase test as a tool in the selection of potato varieties resistant to late blight.
Amer. Potato J. 1959 : **36** : 315–24.

Peroxidase activity of the crude sap of healthy leaves was correlated with degree of resistance to *Phytophthora infestans* (race 0 or 4) in varieties possessing field resistance based on minor genes. No such correlation was found between peroxidase activity and degree of resistance to these races in R_1 varieties. When the protective effect of R_1 was overcome by a compatible race (1,4), degree of resistance to this race was however associated with peroxidase activity in R_1 varieties, resistance then depending mainly or entirely on the minor genes present. It is suggested that a peroxidase test may be useful in the selection of *R* varieties with respect to minor genes responsible for a high degree of field resistance.

1706 HAUSSDÖRFER, M.
Untersuchungen über die Entwicklung des Befalls mit den verschiedenen physiologischen Rassen der *Phytophthora infestans* bei einigen mittelfrühen und mittelspäten Kartoffelsorten im Jahre 1958. **(Investigations on the development of the attack with different physiological races of *Ph. infestans* on some medium-early and medium-late potato varieties in the year 1958).**
Züchter 1959 : **29** : 237–39.

From 20 districts in the German Democratic Republic, 591 samples of *Phytophthora* were collected and the races analysed. No regional specialization of races was found. The medium-early varieties Bona and Meise [Titmouse] were attacked 10 days before the later varieties Nova and Aquila. It is suggested that in breeding resistant early varieties, races carrying R_1 should be used, for this gene confers resistance to race 4 which is the first to occur during the season.

1707 KEDAR (KAMMERMANN), N., ROTEM, J. & WAHL, I.
Physiologic specialization of *Phytophthora infestans* in Israel.
Phytopathology 1959 : **49** : 675–79.

Forty-eight isolates were identified on potato differential hosts and 25 isolates were tested on tomato differentials. From 1954 to 1957 race 4 was found to increase from 68% to 100% while race 0 decreased from 24% to 0%. Of the 25 isolates tested on tomato differentials, 19, which were identified as race 4 on potato differentials, could be divided by tomato reaction into 36% T_{00}, 28% T_0, 16% T_1, 16% T_1a and 4% of a type designated T?, capable of attacking Rutgers, WVa106, WVa36–1 and WVa700. This confirmed that no correlation existed between potato race characteristics and reaction on tomato hosts.

1708 FEDOTOVA, T. I.
(What is new in research on potato blight).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 2 : 129–30. [Russian].

Most potato varieties and hybrids, including Kameraz 1 and others which have previously been regarded as resistant to blight, have succumbed to new virulent Soviet strains of *Phytophthora* in infection trials at the Institute of Plant Protection. Among the few forms that are resistant to leaf and tuber infection are P363, originating from the Potato Institute, and the following hybrids bred at the Institute of Plant Industry: 339, 885, 1249, 1264, R415, R6–150 and R6–885. The main difficulty of breeding for resistance, maintaining the cultures of virulent biotypes, has been overcome. The method consists of culturing the strain upon an artificial substrate and covering it with sterilized sunflower oil immediately after it has begun to develop, or two days after transfer, whilst the surface of the medium is still free from mycelium.

1709 Sakai, R.
(Physiological studies on late blight. 11. On differences in the cultural characteristics of physiological races of late blight).
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1959 : No. **74** : 57–72. [Japanese].

Races 0; 1; 4 and 1,4 were studied. These differ little in optimum pH for growth or in utilization of various carbon sources. Differences were noted in utilization of nitrogen sources; in particular $(NH_4)_2SO_4$ was as readily utilized as alanine by races 1 and 1,4 but less readily by races 0 and 4. The latter two races are also less capable of utilizing methionine which, in any case, is only utilized sparingly.

An alcohol-soluble growth factor present in oatmeal stimulates growth of races 1 and 1,4; bean extract stimulates growth of race 0; while yeast extract promotes growth of race 4.

1710 Schick, R. & Schick, E.
Die Differenzierung der verschiedenen Rassen der *Phytophthora infestans* auf Sämlingen von *S. demissum* (Lindl.) und *S. stoloniferum* (Schlecht. et Bouché). **[Differentiation of different races of *Ph. infestans* on seedlings of *S. demissum* (Lindl.) and *S. stoloniferum* (Schlecht. et Bouché)].**
Züchter 1959 : **29** : 220–25.

A test collection of seedlings of *S. demissum* and *S. stoloniferum* used at Gross-Lüsewitz is described. This collection has been found to give more reliable results in differentiating races of *Ph. infestans* than clones of *S. demissum* x *S. tuberosum* hybrids in which it is very difficult to prevent virus infection. Emphasis is placed on the importance of having the conditions as favourable as possible for infection with *Phytophthora* and the infection procedure used at Gross-Lüsewitz is outlined.

1711 Rubin, B. A. & Ozereckovskaja, O. L.
(The hexose monophosphate path of respiration in potato tubers).
Izv. Akad. Nauk. SSSR (News Acad. Sci. USSR) Ser. Biol. 1959 : No. 2 : 257–64.

The activity of the dehydrogenases of glucose-6-phosphate and 6-phosphogluconate in potato tubers is positively associated with resistance to *Phytophthora*. It was found that the dehydrogenase activity in infected tubers of the susceptible variety Early Rose rose sharply by comparison with that in infected tubers of the resistant seedling 170.

International Conference on potato wart.
Sborn. čsl. Akad. zeměd. Věd: Řada rostlinná Výroba 1959 : **32** : No. 6 : Pp. 236.

1712 *Săvulescu, A., Constantinescu, E., Constantinescu, C., Ceacoilu, N. & Puscasu, A. Problems concerning the black wart disease of potato and the results of research work in the Rumanian People's Republic.* (*pp. 31–46*).

Resistant and susceptible varieties of potato are listed. It appears that there is only one biotype of *Synchytrium endobioticum* in Rumania and this resembles the so called "normal" biotype. Breeding for resistance is being carried out at four experimental stations in different parts of the country. In crosses in which both parents were susceptible, for example Maikönig [May King] x Katahdin and Stahanovka x Katahdin, more than 75% of the progeny were susceptible. From the resistant progeny, lines with good tuber shape and good cooking quality have been obtained. From crosses in which one parent was resistant, for example Houma x Katahdin and Stahanovka x Merkur, 45 to 50% of the progeny was resistant. Crosses between two resistant varieties such as Merkur x Priska and Viola x Frühmolle yielded mostly resistant progeny, 10 to 20% of the progeny being susceptible. *Solanum demissum* and *S. acaule* have been crossed and back crossed with resistant varieties of *S. tuberosum* and some new resistant lines obtained.

New varieties and lines are listed; Someșan, Ardeal and Napoca were tested in the German Democratic Republic and found to be susceptible to biotype G.

1713 *Hey, A. Die Kartoffelkrebsforschung in der Deutschen Demokratischen Republik und ihre praktische Auswertung.* (*Research on potato wart disease in the German Democratic Republic and its practical evaluation*). (*pp. 59–68*).

The distribution of the different biotypes of *Synchytrium endobioticum* in the German Democratic Republic and the methods used for identifying the biotypes are discussed. At Gross-Lüsewitz the reaction of wild and primitive types of potato to different races of the pathogen is being investigated. Many foreign varieties and new selections have also been tested.

1714 *Vuittenez, A. Études et observations sur la galle verruquese de la pomme de terre dans l'est de la France. (Studies and observations on potato wart in east France). (pp. 69–78).*

Mention is made of procedures used in testing potato varieties for resistance to *Synchytrium endobioticum* and the reaction of some varieties is described. In east France only the ordinary biotype of *S. endobioticum* has been found.

1715 *Janežić, F. Der Kartoffelkrebs in Jugoslawien. (Potato wart in Jugoslavia). (pp. 91–96).*

Mention is made of the large-scale testing of potato varieties for resistance to wart carried out in Jugoslavia, the reaction of some varieties at Planina being noted. The biotype of the pathogen present in Jugoslavia seems to be slightly more aggressive than the normal type; Virginia, which is resistant in Germany, was found to be susceptible to the Jugoslavian biotype.

1716 *Ullrich, J. Die physiologische Spezialisierung von* Synchytrium endobioticum *(Schilb.) Perc. in der Bundesrepublik. [The physiological specialization of* S. endobioticum *(Schilb.) Perc. in the Federal Republic]. (pp. 111–16).*

Methods used in testing potatoes for susceptibility to wart are described. Eight biotypes of the pathogen are listed; these are distinguished by numbers instead of the letters used by Hey. A test collection of potato varieties has been formed by which it is possible to differentiate five biotypes in Federal Germany.

1717 *Blattný, C. Příspěvek k poznáni a hodnocení biotypů rakoviny brambor* Synchytrium endobioticum *(Schilb.) Perc. a další podněty k poznání této choroby. [A contribution to the study and evaluation of the biotypes of potato wart,* S. endobioticum *(Schilb.) Perc., and further progress in the knowledge of this disease]. (pp. 117–20).*

In 1936 two biotypes of *S. endobioticum* were found in Bohemia, an aggressive type in the south. A Carpathian biotype is identical with the aggressive biotype which is now the only strain in Czechoslovakia. Aggressive biotypes have been bred experimentally.

1718 *Braun, H. Die biologische Spezialisierung von* Synchytrium endobioticum *(Schilb.) Perc. [The biological specialization of* S. endobioticum *(Schilb.) Perc.]. (pp. 121–30).*

Eight biological strains of *S. endobioticum* have been found in Germany and it seems probable that there are more. Tables are given showing the reaction of some varieties to different biotypes.

1719 *Leszczenko, P. & Roguski, K. Hodowla w Polsce ziemniaków odpornych na raka ziemniaczanego* Synchytrium endobioticum *(Schilb.) Perc. [The breeding of potatoes resistant to wart,* S. endobioticum *(Schilb.) Perc. in Poland]. (pp. 145–52).*

At the Institute for Plant Breeding and Acclimatization in Bydgoszcz, the varieties Nowa Huta, Imandra and Aquila had a high proportion of wart-resistant seedlings in their progenies. Nowa Huta is fully resistant to biotypes D and G of *Synchytrium endobioticum.* The strain present in Poland seems to be identical with biotype D; 21 new potato varieties resistant to this biotype have been bred in Poland.

1720 *Zadina, J. Výsledky genetického studia vzdornosti brambor proti rakovine. (Results of a genetical study of the resistance of potatoes to wart). (pp. 153–58).*

Although mostly resistant varieties were used in hybridization experiments at the Keřkov Potato Breeding Station, about 37% of the breeding material produced in four years was rejected on account of its susceptibility to wart. In this way many hybrids with useful characters may have been lost. With a view to reducing the percentage of discarded plants, varieties frequently used in experimental crosses were investigated to find how they transmit resistance to their progeny. Sixty varieties differing in length of vegetative period were studied. The most useful varieties for breeding were Táborky, Gromadskie and Jara, which on self pollination yielded only resistant progeny. Depesche, an early maincrop variety, gave 1·8% susceptible progeny.

1721 *Bojňanský, V. Vplyv rakoviny zemiakov* Synchytrium endobioticum *(Schilb.) Perc. na šl'achtitel'ské práce a ich odraz v praxi. [The influence of potato wart,* S. endobioticum *(Schilb.) Perc., on breeding work and the effect of the latter upon practice]. (pp. 159–64).*

Mention is made of the difficulties in breeding early culinary varieties which are immune to wart; this problem is particularly urgent in hot dry regions where early varieties give a higher yield than late varieties. Rose-coloured varieties are particularly suitable for such regions because they are resistant to degeneration. However they are banned in Czechoslovakia because they are susceptible to wart. It is suggested that this regulation be removed; this would aid breeders in producing better early varieties for warm regions.

1722 *Fedotova, T. I.* [*The biology of* S. endobioticum (*Schilb.*) *Perc. and the resistance of potato varieties to wart*]. (*pp. 165–74*). [Russian].

At the All-Union Institute for Plant Protection and various regional stations in the USSR, the inheritance of resistance to wart has been studied in a large number of hybrids and varieties. Some varieties of Soviet origin were found to produce a large number of resistant progeny (70–90%). These varieties include Katjuša [Little Katja], Zvenevoj [Detachment] and Priekul'skij rannij [Early Priekuļi].

1723 *Spitzová, B. & Zakopal, J. Metody laboratorního zkoušení kříženců na vzdornost vůči rakovině brambor.* (*Methods of laboratory testing of crosses for resistance to potato wart*). (*pp. 179–84*).

It was found that dormant eyes of tubers harvested several days earlier than is usual can be infected with wart and also it was possible to infect the eyes immediately after harvesting, that is whilst they were still growing. The method used involves immersing the tubers in water for 4–6 hr. at 8–15° C., the terminal eye being uppermost and covered with a piece of tissue cut from a growing wart 3–6 weeks old. After the tubers are infected they are covered with soil and kept in a greenhouse at 12 to 15° C. The tubers are inspected after 3 or 4 weeks. This method provides results more quickly than older methods and the period of time in which tests can be carried out is longer.

1724 *Lipsitz, D. V.* (*Biochemical studies of the resistance of potatoes to wart*). (*pp. 189–96*). [Russian].

It has been shown that the oxidation of phenols plays no important part in the immunity of potatoes to wart. Only susceptible varieties show an increase in respiratory rate on coming into contact with the pathogen. There is some evidence that caffeic acid is a factor in determining resistance. Various growth inhibitors have been found in the plant tissues and these may be important in conferring resistance.

1725 Bazán de Segura, C. & Ochoa, C.
Búsqueda de fuentes de resistencia en papa al hongo *Verticillium albo-atrum.* **(Search for sources of resistance to the fungus *V. albo-atrum* in potato).**
Inf. mens. Estac. exp. agric. La Molina 1959 : **33** : No. 378 : 1–7. (Mimeographed).

Among about 100 varieties of *Solanum andigenum* inoculated with *V. albo-atrum*, eleven were resistant and five moderately resistant. Eight out of 22 hybrids, including interspecific hybrids, were resistant and four moderately resistant. Moderate resistance was also found in one out of four *S. goniocalyx* varieties and two out of ten *S. stenotomum* varieties.

1726 Rothacker, D. & Stelter, H.
Beiträge zur Resistenzzüchtung gegen den Kartoffelnematoden (*Heterodera rostochiensis* Wollenweber). IV. Das Verhalten von resistenten Bastardklonen aus der Kreuzung zwischen *S. tuberosum* subsp. *tuberosum* mit *S. tuberosum* subsp. *andigenum* auf nematodenverseuchten und nematodenfreien Flächen. [**Contributions to breeding for resistance to potato eelworm (*H. rostochiensis* Wollenweber). IV. The behaviour of resistant hybrid clones from the cross of *S. tuberosum* subsp. *tuberosum* with *S. tuberosum* subsp. *andigenum* on nematode-infected and nematode-free areas**].
Züchter 1959 : **29** : 241–51.

A series of nematode-resistant clones comprising the F_1 of the above cross and the F'_2 (*Solanum andigenum* x *S. tuberosum*) x *S. tuberosum* were grown on land heavily infected with nematodes and also on comparable soil free of nematodes. The growth of the clones was depressed by varying degrees on the infected land and growth depression was generally accompanied by a decrease in yield. Some of the clones combined high yielding capacity with tolerance of infected soil and most of the clones outyielded susceptible varieties on the infected soil. Although the number of tubers per plant was generally lower on infected soil, tuber weight showed little variation. Starch content decreased on the infected soil. [Cf. XXIX, 2834].

1727 Aardappelrassen met resistentie tegen aardappelmoeheid. (**Potato varieties with resistance to potato sickness**).
Zaadbelangen 1959 : **13** : 222–23.

A list is presented of six medium-early, four medium-late and nine late industrial varieties and three medium-early table varieties, all resistant to potato root eelworm. The parentage and the breeder of each variety are also noted.

1728 Tyktin, N. V.
(**Potato nematode resistance**).
Kartofel' (Potato), Moskva 1959 : No. 1 : 47–49. [Russian].

Many wild and cultivated species and hybrids were grown on soil heavily infested with *Heterodera rostochiensis* at Vilnius, Lithuania, and cyst counts were made to determine their resistance. Of the material tested, *Solanum catarthrum* and *S. ballsii* proved highly resistant, while *S. sucrense*, which has previously been regarded as resistant, was found to be susceptible. *S. ballsii* transmitted resistance to some of its hybrid progeny. Considerable variability in resistance was observed in the hybrids from *S. ballsii* x (*S. phureja* + Kameraz + *S. schreiteri*). Forms distinguished by fair resistance to the nematode also occurred among some seedlings of *S. andigenum*.

1729 Werner, E.
Badania nad różnymi formami odporności na stonkę ziemniaczana (*Leptinotarsa decemlineata* Say) mieszańców międzygatunkowych ziemniaka. [**Investigation on different types of resistance to Colorado beetle (*L. decemlineata* Say) in interspecific hybrids of potato**].
Hodowla Roślin Aklimatyz. Nasiennictwo 1958 : **2** : 351–70.

Resistance was studied in hybrids of *Solanum tuberosum* (T), *S. demissum* (D), *S. chacoense* (Ch), *S. commersonii* (C) and *S. andigenum* (A). When the resistance of T was regarded as zero and that of D as 10, hybrids involving D had 32·1% in resistance class 0–2·5 and 10·7% in class 7·6–10, while those involving Ch had 23·9% in class 0–2·5, 12·8% in class 7·6–10 and 4·2% above 10. Among populations in class 6–7, some gave good yields per plant, e.g. one with the pedigree DT.DT.ChCT gave 1100 g. and another with DT.DT.ChCT.ChCT gave 740 g. Numbers of eggs laid by the beetle were smaller on Ch and Ch hybrids, the following figures being given: T, 4605; Ch, 0; D, 31; DTT.DT, 2893; DTT.ChD, 476; DT.DT, 3309; and DT.DT.ChCT, 0.

1730 Săvulescu, A. & Bretan, I.
Problema degenerării cartofului: observaţii şi date experimentale cu privire la comportarea unor soiuri de cartofi la staţiunile I.C.A.R. din Transilvania. (**The problem of the degeneration of the potato: observations and experimental data on the behaviour of some potato varieties in the stations of the Rumanian Institute of Agricultural Research in Transylvania**).
Probl. Agric., Bucureşti 1958 : **10** : No. 1 : 15–24; No. 2 : 38–45.

Various theories of the nature of degeneration of the potato are reviewed and data are provided on the percentage of degeneration and the incidence of virus diseases among numerous varieties grown in Transylvania. The correlation between the two phenomena is pointed out. Summer planting failed to provide satisfactory control of degeneration.

1731 Wang, H.
(**Regional trials of culinary sweet potatoes**).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1959 : New Ser. No. 25 : 52–63. [Chinese].

Five new varieties were tested at eight localities during 1955–58. Observations were made on yield, content of protein, fat, carbohydrates and vitamins A, B_1, B_2 and C, suitability for processing and morphology. The most satisfactory variety was C454 (= Tainung 57 [Taiwan Agriculture 57]), a hybrid of Tainung 27 x Nancy Hall.

1732 **Sweetpotato for the west.**
Crops & Soils 1959 : **12** : No. 2 : p. 21.

Apache, released jointly by the US Department of Agriculture and the New Mexico and California Agriculture Experiment Stations, has an attractive orange colour and a carotene content one third higher than that of good stocks of Porto Rico. It has good baking quality and stores well. Yields of Apache on irrigated soils in the west and southwest have been particularly high.

1733 Lam, S. L., Thompson, A. E. & McCollum, J. P.
Induction of flowering in the sweet potato.
Amer. Soc. hort. Sci. 1959 : **73** : 453–62.

Lam, S.L.
Induction of flowering in the sweet potato (*Ipomoea batatas* Lam).
Diss. Abstr. 1959 : **19** : LC Card Mic 58–5445 : 2708–09. (Abst.).

Grafting experiments are described from which it has been concluded that, by choosing appropriate *Ipomoea* species and adjusting the temperature and photoperiod, the breeder should be able to induce any variety of sweet potato to flower during any season of the year. In addition, the time of flowering of the grafted sweet potato can be predicted from information obtained on floral initiation and development.

1734 Mohammed Kasem Ali
The effect of variety, length of storage, and the baking process on the carbohydrate content and table quality of sweet potatoes.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–1527 : 3090–91. (Abst.).

Of four varieties, Acadian was best in quality, and contained the largest amount of nonreducing sugar and the smallest quantities of reducing sugar and starch. Softness of the baked roots was negatively correlated with starch content and positively with amount of nonreducing or total sugar.

1735 Sakai, K. & Sirasaka [Shirasaka], S.
(**On the effect of competition between sweet-potato varieties differing in habit on the yield of top and tubers**).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1959 : **5** : 173–91. [Japanese].

Three varieties, respectively prostrate, intermediate and erect, were grown (1) intermixed in the same row, (2) in mixed single rows of each variety, and (3) in mixed triple rows of each variety. Marked competitive effects were noted, varieties with either erect habit or vigorous top growth tending to suppress the others. The significance of these results in bulk selection is discussed.

FIBRES

1736 Borisov, G.
(**Some results of cotton varietal trials**).
Hlopkovodstvo (Cotton Growing) 1959 : No. 2 : 23–29. [Russian].

Many recent cotton varieties tested in Central Asia and Transcaucasia in 1958 have proved superior to the previous standards in productiveness, earliness, fibre quality, the size of bolls or resistance to *Fusarium* wilt. Among the varieties specially commended are S1581, S1622, S4727 and the fine-fibred cottons 5010V and 5230V, all of which have been previously described [cf. XXIX, 1764].

1737 Sergueff, M.
Organismes chargés de la conservation de la qualité des semences du cotonnier en U.R.S.S. (**Organizations in charge of the conservation of cotton seed quality in the USSR**).
Cot. et Fibr. trop. 1959 : **14** : 61–77.

Mention is made of recent improvement work on the variety 611B in Kazahstan and on the imported variety Fouadi in Azerbaijan. From Uzbekistan, a new selection from C450, designated C450–555, is reported to give a higher yield than the parent strain.

1738 Kottur, K. G.
A note of the American cotton improvement works at Gadag (Dharwar district).
Mysore agric. J. 1959 : **34** : 35–41.

A general review is given of improvement trials of American cotton varieties [cf. 579].

1739 Marappan, P. V. & Guruswamy Raja, V. D.
A review of the progress in the evolution of Karunganni cotton strains resulting in the release of K. 6 (Pandyan) and scope for further improvement in Madras State.
Madras agric. J. 1959 : **46** : 373–79.

An historical survey is given of the improvement of Karunganni cotton (*Gossypium arboreum*) for the black soil tract in the districts of Tirunelveli, Ramanathapuram and Madurai. K6 was developed from a cross of hybrids between races *indicum* and *cernuum*. It is to replace K2 and K5, over which it has shown a superiority in lint yield, ginning outturn, staple length, fineness and yarn strength. Work is now in progress to develop a variety surpassing K6 in spinning value and fibre length and equal to it in ginning percentage and lint yield.

1740 Džalilov, H.
(**Ways of raising cotton production in Uzbekistan in the current seven-year period**).
Hlopkovodstvo (Cotton Growing) 1959 : No. 1 : 12–16. [Russian].

Among the recommendations made is the introduction of improved varieties bred in recent years at Taškent, in Fergana or Kara-Kalpakia. The new varieties include the fine-fibred S8017, which is characterized by earliness, high yield, fine quality of fibre and resistance to *Fusarium*, and 144F, S1581, S1622, S4727 and KK2056, which are more adapted than 108F to the climatic and soil conditions of some districts. Most of these are earlier and more productive than 108F and have good technological properties. KK2056 is the earliest among them, while 144F is drought resistant and suitable for cultivation under rainfed conditions.

West African Cotton Research Conference held at the Regional Research Station, Ministry of Agriculture, Samaru, Northern Nigeria, 18th to 23rd November, 1957 : Pp. 209.

1741 *Wouters, W. La sélection cotonnière au Congo Belge. (Cotton breeding in the Belgian Congo). (pp. 76–87).*

The aims and achievements of breeding programmes during the last forty years are reviewed for each of the three regions involved. Methods of selection are described and future lines of research are outlined.

1742 *Gutknecht, J. Aperçu sur la sélection de variétés de coton au Tchad. (An outline of the breeding of cotton varieties at Chad). (pp. 88–97).*

The variety Allen, which has replaced Triumph since 1939, has a low ginning percentage. Two new selections of N'Kourala, 42–5 and 44–10, were found to be superior to Allen in yield, fibre quality and, in the case of 44–10, ginning percentage.

Seed of the variety Samaru 26C (selected from D31, a bulk selection of Allen, at Samaru) was multiplied and distributed in the Zaria region as a mixture with Allen. From the progeny of this mixture, which was designated Allen Zaria, four new varieties were selected: A49T, A50T, A150 and A151. All these varieties show increased ginning percentages and high resistance to bacterial blight, *Fusarium* wilt and jassid attack. The variety A150 is suitable for high rainfall areas.

1743 *King, H. E. & Lawes, D. A. Breeding systems used for cotton at Samaru. (pp. 98–103).*

Four breeding systems are described, comprising orthodox plant to row systems with and without replication of progeny rows, a modified mass pedigree system and a "panmixis" project still in its early stages. Breeding work leading to the production of Samaru 26C and Samaru 26J is described.

1744 *King, H. E. & Lee, B. J. S. Genetic differences in vitality of cotton plants cut back at the end of a season. (p. 104).*

Genetic differences in the percentage of plants which survive and sprout again, after being cut back, have been demonstrated in *G. hirsutum* 'Samaru 26C'. No correlation was found between regrowth and the yield before cutting, or with infection by stem borer (*Sphenoptera* sp.). Since the uprooting of previous-season plants is not practicable, the possibility of breeding plants with reduced ability to survive cutting is suggested. Further studies are being made.

1745 *King, H. E. A note on the design and analysis of replicated progeny row tests. (pp. 105–06).*

"A method of using an incomplete block design for yield comparisons while measuring other characters on composite samples is suggested as a labour saving device in large replicated progeny row tests. A way whereby data so obtained may be handled statistically is pointed out."

1746 *Angelini, M. Quelques résultats obtenus en côte d'Ivoire dans la recherche des moyens permettant de limiter l'incidence du parasitisme sur la production cotonnière. (Some results obtained on the Ivory Coast in the search for means of restricting the incidence of parasitism on the cotton crop). (pp. 107–12).*

Preliminary results having shown that *G. barbadense* cottons are less susceptible than *G. hirsutum* types to parasitism by *Platyedra gossypiella*, factors of resistance are being sought.

1747 *Arnold, M. H. Resistance to bacterial blight* (Xanthomonas malvacearum) *in Lake Province 'Local' cotton. (pp. 159–65).*

An investigation was made to determine the extent of variation in resistance to bacterial blight in derivatives of the variety Local. The most recent seed issue, UK55, was developed from two selections of 8/290 and possesses greater resistance than other Local derivatives. If genetic factors other than B_2 are involved, it should be possible to breed for still higher resistance from 8/290 stocks.

Preliminary findings suggest that in some strains there may be an association of stem resistance with boll resistance.

1748 *Parker, H. M. Survival of bacterial blight of cotton* (Xanthomonas malvacearum *(E. F. Smith) Dowson) in crop debris. (pp. 166–74).*

Of nine varieties and selections used in the trials, BAR7/8·1 consistently showed least infection during both years of the trials, with Wilds SVS16/1 only a little less resistant. The variety Albar 49, which was imported from Uganda where its resistance to bacterial blight is high and uniform, proved as susceptible as the other Allen varieties used when treated with diseased debris under these conditions.

Progress Reports from Experiment Stations, season 1957–58.
Emp. Cott. Gr. Corp. Lond. 1959.

1749 *Ruston, D. F. Survey of progress reports for the season 1957–58. (pp. 1–18).*
Cotton breeding is among the activities briefly reviewed.

Tanganyika Territory, Eastern Province. Progress report for the season 1958.

1750 *Smith, R. Plant breeding. (pp. 5–11).*
Trial results have indicated that strains with some degree of resistance to bacterial blight are the more productive ones, although previously yield losses have been attributed chiefly to insect damage. In an attempt to improve ginning outturn in the selection material, all strains with a low outturn have been discarded. Of 1400 single plant selections, 330 have been retained for further testing. Improvements in jassid resistance, yield and other characters have been effected in some strains.

Tanganyika Territory, Lake Province. Progress report the season 1957–58.

1751 *Peat, J. E. & Brown, K. J. Cotton breeding. (pp. 11–13).*
Selections at Ukiriguru, mainly from 8/290–0/334 and 1/667, have shown a higher degree of bacterial-blight resistance than expected and some of the best strains have been retained with a view to possible use in multiline issues.

1752 *Arnold, M. H. & Arnold, K. M. Diseases. (pp. 13–18).*
Back crosses of Albar 51 [cf. XXIX, 4100] were comparable in yield to Uk55 over a range of conditions. Most late strains fell into the higher-yielding classes but a number of early lines were also productive. A third back-cross derivative, E21/15/504, showed good resistance to *Xanthomonas malvacearum* combined with other desirable characters. The programme for transferring the gene B_{6m} to Ukiriguru continued. Up to mid-April, four American varieties and one from the Belgian Congo all proved highly resistant to *Fusarium* wilt, compared with Uk51, but after this date were attacked by jassid and began to show wilt symptoms. A few plants among local strains remained uninfected however and may respond to selection.

1753 *Kenya. Progress report for the season 1957–58. Coast Province. (pp. 5–7).*
Uk51 and Uk55 both outyielded N17 and were superior in jassid resistance. Among material from Ilonga, BSI and 51/77 showed good jassid resistance.

1754 Self, F. W., Hendrix, J. A., Marshall, J. G., Oakes, J. Y. & Woodward, R. S.
Cotton variety tests in Louisiana, 1955–58.
Circ. La. agric. Exp. Sta. 1959 : No. 59 : Pp. 8.
The results of trials carried out on new and established varieties in different parts of Louisiana for four years are summarized.

1755 Rose, M. F.
Cotton research and the development of the commercial crop in the Sudan.
Emp. Cott. Gr. Rev. 1959 : **36** : 252–62.
Attempts to develop Egyptian cotton strains resistant to black arm and leaf curl are reviewed. The L type X1730A selected from Sakel 186 shows near immunity to leaf curl but resists black arm by "its ability to grow away from the disease" rather than by specific resistance.
A range of Old and New World cottons was examined for source material for black-arm resistance for incorporation into commercial varieties. Two promising strains have been developed, BAR14/25 (Sakel type carrying genes B_2 and B_3) and BAFXL1 (L type carrying gene B_2). Since the apparent breakdown of B_2B_3 resistance during 1956–57, attempts are being made to transfer gene B_6 (from *G. sanguineum*) to B_2 and B_2B_3 material.
In the Northern Province several hundred primary selections from American cottons were used in an intensive programme of selfing and selection for low node numbers (earliness). Selected progenies were bulked, giving rise to Wilds 16/1.
Varieties of Egyptian and American cottons suitable for particular regions are reviewed and listed in an appendix.

1756 **(Turkmenian plant breeders).**
Hlopkovodstvo (Cotton Growing) 1959 : No. 2 : p. 64. [Russian].
The following fine-fibred cotton varieties resistant to *Fusarium* wilt have been bred in recent years in Turkmenia: 9182I, 9123I, 9122I, 8981I and I37; the last was obtained by graft hybridization at the Iolatan breeding station and is characterized by large bolls.

1757 Pandya, P. S. & Patel, C. T.
An interesting case of segregation in a *hirsutum-barbadense* cross.
Indian Cott. Gr. Rev. 1959 : **13** : 262–66.
The F_1 resulting from the cross Co.2–1 (*G. hirsutum*) x SI2741 (*G. barbadense*) resembled *G. hirsutum* morphologically but possessed long, fine, silky fibres. Seed collected from one

individual (2376) produced all *hirsutum*-like plants with long silky fibres.
The outcross 2376 x Indo-American 170-Co.2 also produced all *hirsutum*-like plants with long, fine fibres.

1758 PHILLIPS, L. L. & GERSTEL, D. U.
Segregation in new allopolyploids of *Gossypium*. III. Leaf shape segregation in hexaploid hybrids of New World cottons.
J. Hered. 1959 : **50** : 103–08.

In further investigations [cf. XXVIII, 4445], the segregation of genes at locus *L* for leaf shape in genome D was studied in test crosses of the hexaploids (1) *G. hirsutum* (L^O) x *G. raimondii* (l^{RAI}), (2) *G. hirsutum* (L^O) x *G. thurberi* (l^{THU}), (3) *G. hirsutum* (L^S) x *G. thurberi* and (4) *G. barbadense* (L^S) x *G. thurberi*. Parents (1) and (2) were crossed with a *G. hirsutum* with broad leaves (*l*); (3) and (4) were test crossed with broad-leaved hexaploids. The cross of (1) gave a ratio of 1 : 11·9 : 1 for plants with narrow (L^OL^Ol), intermediate ($L^Ol^{RAI}l$) and broad leaves ($l^{RAI}l^{RAI}$). Results from (2) could not be satisfactorily interpreted, mainly because of the difficulty arising in scoring as the result of similarity in the expression of L^O and l^{THU}. Combining the data from (3) and (4), a segregation ratio of 1 : 19·7 : 1 was obtained for phenotypes with narrow (L^SL^Sl), intermediate ($L^Sl^{THU}l$) and broad leaves ($l^{THU}l^{THU}l$). The observations suggest the occurrence of some differential chromosome affinity in (1) and a higher degree of preferential pairing in hexaploids between the New World species and *G. thurberi*. The results for locus *L* are in agreement with those for R_1 [cf. XXVI, 3517] in that 6*x* (*G. hirsutum* x *G. raimondii*) gave narrower segregation ratios for both loci than hexaploids between New World cottons and *G. thurberi*, and the ratios for the two loci were similar for 6*x* (*G. hirsutum* x *G. raimondii*). Hexaploids of *G. barbadense* or *G. hirsutum* (L^S or L^O) with *G. thurberi*, however, gave a narrower ratio for *L* than for R_1. χ^2 values indicated that selective elimination of gametes or zygotes was not important in hexaploids involving *G. thurberi*, homogenic gametes being recovered in segregations for the two loci with about equal frequency.

1759 BEDERKER, V. K.
Individual plant selection as a method of breeding for cotton improvement.
Indian Cott. Gr. Rev. 1959 : **13** : 255–61.

The effectiveness of individual plant selection in cotton improvement is discussed with particular reference to Gaorani cotton (*G. arboreum* var. *neglectum*).

1760 BALLATORE, G. P.
Il problema delle cultivar di cotone. **(The problem of cotton cultivars).**
Progr. agric., Bologna 1959 : **5** : 661–80.

A brief account is given of the cotton cultivars grown in southern Italy and Sicily at various times since 1862. Recent observations have shown the superiority of the Spanish cultivar Andalucia in respect of both earliness and strength of fibre; though certain American cottons such as Deltapine 15, Stoneville 2B and Coker 100 Wilt are slightly better in yield and lint length, Andalucia is considered a promising starting point for breeding locally adapted cottons.

1761 **Brazos is new Texas cotton.**
Crops & Soils 1959 : **12** : No. 2 : p. 20.

Brazos, released by the Texas Agricultural Experiment Station, is a high-yielding variety for east, central and south Texas. Its bolls are about 10% larger than those of Deltapine, fluff well and are suitable for hand or spindle picking. Brazos equals Deltapine in lint percentage and in fibre and spinning properties.

1762 **Rex cotton makes good in Arkansas.**
Crops & Soils 1959 : **12** : No. 1 : p. 33.

This variety [cf. XXVIII, 1862] has shown good seedling vigour and good tolerance of storms; it has given high yields and the production costs were low.

1763 MCMICHAEL, S. C.
Hopi cotton, a source of cotton-seed free of gossypol pigments.
Agron. J. 1959 : **51** : p. 630.

At the US Cotton Field Station, Shafter, Calif., selection of *Gossypium hirsutum* race *punctatum* 'Hopi M' resulted in plants with nearly glandless leaves and bolls but without any material alteration in number of glands in the seeds. Selections having glandless seeds have however been secured from crosses of Hopi M with Upland varieties. Selection of the segregating populations evidently concentrated minor genes for the glandless condition from the Upland parents in combination with a major gene from Hopi M with nearly glandless leaves and bolls as its phenotypic expression. Transfer of the character of glandless seed to commercial varieties has been initiated.

1764 Jambunathan, L. R.
Some preliminary observations on the character of neppiness in cotton in so far as it relates to fibre neps.
Indian Cott. Gr. Rev. 1959 : **13** : 296–301.

Nep frequency is shown to vary from plant to plant within varieties as well as between varieties. It does not appear to be correlated with fibre length or with fibre weight per inch. Immaturity seems to be associated with high nep frequency.

1765 Walton, P. D.
Spinning test results from the Northern and Eastern Provinces of Uganda : 1930–56.
Emp. Cott. Gr. Rev. 1959 : **36** : 276–84.

Regional variation in lint properties and spinning performance was demonstrated in the varieties N17, S47, DE715 and BP50 grown in various districts of the Northern and Eastern Provinces and in BP52 which was grown also in Buganda.

BP52 was found to give higher yields and better quality lint than the other varieties in most districts of the Northern and Eastern Provinces. When grown in Buganda, however, it produced shorter and slightly less mature lint.

1766 Hari Rao Navkal.
Relationships between the fibre-characters measured by the fibrograph with similar characters obtained by the Balls sorter.
Indian Cott. Gr. Rev. 1959 : **13** : 284–87.

It is concluded that while the fibrograph upper half mean gives a reasonably good estimate of fibre length for comparative purposes, the uniformity ratio does not provide a dependable estimate of fibre-length variation.

1767 Iyengar, R. L. N.
Recent advances in cotton technology and their bearing on cotton breeding in India.
Indian Cott. Gr. Rev. 1959 : **13** : 288–95.

A review is given of the techniques and equipment employed in the assessment of the length, fineness, rigidity, strength and maturity, nep frequency, lustre and colour, and spinning performance of cotton fibres.

1768 Parmar, M. U. & Patel, C. T.
A note on the anomalous spinning performance of some Indo-American types.
Indian Cott. Gr. Rev. 1959 : **13** : 318–19.

The length, weight, maturity and strength of fibres from ten cotton varieties are examined in relation to their spinning performance. It is concluded that the assessment of standard fibre properties is not sufficient for accurate prediction of spinning performance in these varieties.

1769 Memon, A. M.
Cotton plant introduction and cotton collection.
Pakist. Cott. 1959 : **4** : No. 1 : 84–86.

Problems of breeding in Pakistan are outlined. Suggestions are made as to collecting expeditions in the New World which might provide sources of useful genes and the areas which should be visited.

1770 Desai, M. K.
Recent advances in the control of (cotton) diseases.
Indian Cott. Gr. Rev. 1959 : **13** : 267–69.

A report is given of progress in breeding varieties resistant to wilt (*Fusarium oxysporum*). Recommended varieties are listed for each tract.

1771 Lakshmanan, M.
Respiratory changes in *Fusarium*-infected cotton.
Phytopath. Z. 1959 : **36** : 406–18.

Resistant varieties of *Gossypium hirsutum* were found to have a lower respiration rate than a susceptible variety of *G. arboreum*. Infection with *Fusarium* caused an increase in the rate of respiration of the susceptible variety.

1772 Joshi, A. B. & Priyavratha Rao, S. B.
The problem of breeding jassid resistant varieties of cotton in India.
Indian Cott. Gr. Rev. 1959 : **13** : 270–79.

While a hairy leaf surface gives jassid resistance, it encourages thrips and aphids. Suggestions that leaf-vein toughness may confer resistance by inhibiting oviposition show the need for finding tough-veined varieties.

1773 Iyengar, R. L. N.
An instrument for the determination of the toughness of the veins of cotton leaves.
Indian Cott. Gr. Rev. 1959 : **13** : 280–83.

Interest in leaf-vein toughness as a possible means of controlling jassid attack has resulted in the development of this device. It consists essentially of a gramophone needle fixed to the lower surface of a horizontal lever suspended on a knife edge. Pressure is applied by means of a hydrostatic loading device, and the amount of pressure is calculated from the volume of water transferred to a measuring cylinder and the distances of the needle and loading points from the knife edge.

1774 ANGELINI, A.

Note préliminaire sur la recherche de caractères de résistance à *Platyedra gossypiella*. **(A preliminary note on the search for characters of resistance to *P. gossypiella*).**

Cot. et Fibr. trop. 1959 : **14** : 51–56.

The penetration of newly-hatched larvae was investigated in two glandless *G. hirsutum* varieties, Allen 333 and 77C, in one glandular *G. barbadense* variety, Mono 55, and in two new selections, K1 and K2. K1 was developed by crossing *G. arboreum* with *G. thurberi*, doubling the chromosome number of the hybrid with colchicine, and crossing this tetraploid hybrid with *G. hirsutum*. K2 was developed similarly from *G. hirsutum* x *G. arboreum*, the hybrid being treated with colchicine and crossed with *G. raimondii*.

In Mono 55 dead larvae were frequently found trapped on the epidermis by glandular secretions. In K1 some larvae were found enclosed in a pustule on the inner surface of the carpels. In strain 77C larvae frequently died before penetrating the tough endocarp and were always less well developed than in plants where endocarp penetration was easy.

Hybridization programmes are in progress using the resistant cottons *G. herbaceum* var. *acerifolium* and *G. thurberi*.

When bracts were absent parasitism was less severe. Crossings are therefore being undertaken using *G. armourianum*, whose bracts fall at flower opening, and *G. herbaceum* var. *acerifolium*, where the bracts are considerably reduced.

1775 DURRANT, A. & TYSON, H.

Conditioned lines of flax.

Nature, Lond. 1960 : **185** : p. 60.

It has been reported that considerable differences in plant size (weight) produced by treatment of inbred flax with combinations of N, P and K fertilizers were transmitted unchanged to succeeding generations [XXVIII, 4468]. Further experiments are described which were carried out during 1958 on the second, third and fourth generations of two extreme types, NK (small) and NPK (large), respectively the result of N + K and N + P + K applications. In the fourth generation, NPK plants were still several times the size of NK individuals, with no evidence that the difference between the types had diminished. Seed taken from stock and scion of the reciprocal grafts of NPK and NK made in the previous year again gave rise to highly uniform plants of the two types, identical with plants from seed from (1) ungrafted controls and (2) scions grafted on similar stocks. Further reciprocal crossing of the two types showed their transmission to be equilinear. "It seems that the small deviation towards the female parent previously reported was a maternal effect due to those crosses being made between types growing in their respective environments in which they were conditioned." Whether the F_1 plants exhibited dominance depended on the environment in which they were grown. Heterosis occurred only in F_1 seed weight. Departures from the mid-parental value do not necessarily mean that the primary effect of the environmental conditioning had been genic and dominant. Quantitative cytoplasmic differences, if transmitted equally through the ♀ and ♂ gametes, could also be responsible for those departures. As revealed by logarithmic growth rates, NPK and NK showed fundamental metabolic differences, such as might be found between two distinct genotypes. The first generation of a diallel cross between NK, NPK, two linseed varieties and two flax varieties was analysed with respect to plant, side-shoot and centre-shoot weights and side-shoot height and length. The array covariance/variance graph for each character indicated no difference between NK and NPK in dominant genes. The two types also showed the same nonallelic interaction with one of the linseed varieties in side-shoot weight. The range of environmentally conditioned types, of which NK and NPK are the extremes, resembles the continuous variation typical of a genetically determined quantitative character, but the relationship between the two systems involved is not yet known.

1776 COLHOUN, J.

Testing for resistance to *Polyspora lini* Laff. in flax breeding.

Trans. Brit. mycol. Soc. 1959 : **42** : 370–77.

A detailed account is given of a pot technique for determining resistance to the stem-break phase of *P. lini* [cf. 125]. The method is a more exacting test than can be applied under field conditions.

1777 ATAL, C. K.

Sex reversal in hemp by application of gibberellin.

Curr. Sci. 1959 : **28** : 408–09.

Gibberellin has been shown to induce formation of male and hermaphrodite flowers in genetically female plants. The number and distribution of male flowers were variable, and reversal was shown to occur during differentiation of the flower primordia.

1778 SULBHA, K. & SWAMINATHAN, M. S.
Effect of grafting on fruit-set and embryo development in crosses between *Corchorus olitorius* and *C. capsularis*.
Curr. Sci. 1959 : **28** : 460–61.

Grafting between the two species led to improvement in fruit set but none in the development of the hybrid embryo. Complementary lethal genes probably affect embryo development in this cross. An attempt to induce mutations inactivating the incompatibility reaction might be worth consideration.

1779 AUBRY, F.
La culture de l'*Hibiscus* en Afrique du Nord. (***Hibiscus* cultivation in North Africa**).
Cot. et Fibr. trop. 1959 : **14** : 1–28.

In the course of an historical review of fibre-plant cultivation in Morocco, mention is made of two new *H. cannabinus* varieties selected at the Deroua Estate and designated Deroua Rouge [Red Deroua] and Deroua Rose [Pink Deroua].

1780 KUWADA, H.
(Studies on interspecific and intergeneric hybridization in the Malvaceae. I. F_1 plants of *Hibiscus mutabilis* L. x *H. Moscheutos* L.).
Ikushugaku Zasshi/Jap. J. Breeding 1959 : **9** : 12–20. [Japanese].

A detailed morphological and anatomical description is given of the above hybrid. It has $2n = 65$ chromosomes, the meiotic configuration being $19_{II} + 27_{I}$, suggesting that the parents have at least one genome in common. No seed was obtained after self, back or open pollination.

SUGAR AND STARCH PLANTS

1781 D'EMMEREZ DE CHARMOY, D.
Le rôle des cannes hybrides dans l'évolution de l'industrie sucrière réunionnaise. (**The role of hybrid canes in the development of the Réunion sugar industry**).
Rev. agric. Réunion 1959 : **59** : 201–11.

The annual sugar production of Réunion has increased from 40 to 200,000 tons in one century in spite of the many diseases attacking sugar cane. In an historical account, it is shown how this result has been achieved by the continuous introduction of improved varieties which have replaced less valuable older types.

1782 WIEHE, P. O.
Résumé du rapport annuel de l'Institut de Recherches Sucrières pour 1958. **(A summary of the annual report of the Sugar Research Institute for 1958).**
Rev. agric. sucr. Maurice 1959 : **38** : 53–98.

[Cf. 597].

1783 SEGALLA, A. L. & ALVAREZ, R.
Variedades de cana-de-açúcar. II. Série de ensaios realizados no período 1953–1956. (**Sugar-cane varieties. II. Series of trials carried out in the period 1953–56**).
Bragantia 1958 : **17** : 45–79.

Of 16 varieties tested at six stations in the state of São Paulo, Brazil, CB40/69, CB41/76 and Co.419 are recommended for planting throughout the state, while CB40/19, CB38/22 and CB41/70 are recommended for more limited areas. [Cf. XXVII, 4216].

1784 BUZACOTT, J. H.
Silver anniversary of cane breeding at Meringa.
Cane Gr. quart. Bull. 1959 : **23** : 40–41.

Twenty-one of the Q varieties of sugar cane are listed in order of importance in Queensland.

1785 SKINNER, J. C.
Controlled pollination of sugar cane.
Tech. Commun. Bur. Sug. Exp. Sta. Qd. 1959 : No. 1 : Pp. 20.

The efficiency of spatial isolation and voile crossing lanterns was examined using, as a measure of contamination, the amount of viable seed set by flowers of the self-sterile variety Q44. Results showed a high level of contamination. Pollen-proof lanterns of closely woven cotton materials are now being introduced which, when closed at the bottom, give absolute isolation. Seed production has been made more efficient by the introduction of deep-freeze storage for surplus seed.

1786 MAN MOHAN SINGH & HARBANS SINGH
Splitting in sugarcane varieties.
Indian J. Sugarcane Res. Developm. 1959 : **3** : 202–06.

An investigation at the Sugarcane Research Station, Jullundur, Punjab, showed cane splitting to be mainly a varietal character. Of the six varieties studied, Co. L9 and Co. L29 were almost free from splitting.

1787 Dunckelman, P. H.
Flowering and breeding performance of container-grown sugarcanes inducted to floral initiation under natural exposures at Canal Point, Florida.
Sug. Bull., N. Orleans 1959 : **38** : 46–53.

Flower initiation and panicle production were readily induced in container-cultured sugar-cane varieties grown out of doors. Three varieties, Co.29, Co.617 and CP34–79, which failed to flower in the field, produced flowers when grown in containers where water level, fertilization, pruning and pests were carefully controlled.

1788 Lal, K. N. & Tandon, J. N.
Physico-chemical properties of sugar cane sap as affected by shoot development and plant parts.
Indian J. agric. Sci. 1958 : **28** : 273–83.

The physicochemical properties of sap from the top, middle and bottom canes of five varieties were determined and discussed with regard to age and maturity.

Varietal differences were significant with regard to density, surface tension, viscosity, osmotic pressure and solute concentration, but not with regard to bound water content. Varieties CoS.109 and Co.312 rated highest for most of the above characters, and on the basis of bound water content, CoS.109 may be regarded as a drought-resistant variety.

1789 Chang, H. & Shih, C. Y.
A study on the leaf mid-rib structure of sugar-cane as related with resistance to the top borer (*Scirpophaga nivella* F.).
Taiwan Sug. 1959 : **6** : No. 8 : 18–22.

A preliminary report is made of a comparative study of midrib anatomy in nine new strains of sugar cane. Greater density (smaller diameter) of parenchymatous cells was correlated with increase in the thickness of the epidermis and with increased resistance to *S. nivella*. Of the strains examined, F136 showed greatest resistance.

1790 Donà dalle Rose, A. & Breccia, A.
Facoltà germinativa del semebietole sottoposto a radiazioni ionizzanti. **(Germinating capacity of sugar-beet seed exposed to ionizing radiations).**
Sementi elette 1959 : **5** : No. 6 : 26–35.

Glomerules of cultivar 359 of the Stazione sperimentale di Bieticoltura [Beet Research Station] at Rovigo, Italy, were treated with varying doses of γ radiation from Co^{60}. A dose of 1150 r. applied to moist glomerules caused a significant acceleration of germination; doses of 5000 r. were no more effective but even a dose of 220 r. had a certain stimulating effect. High doses of 60,000 r. and 120,000 r. applied to dry glomerules retarded germination slightly and provoked certain chromosome aberrations.

1791 Orlovskij, N. I.
(Methods and aims in sugar-beet breeding).
Sahar. Svekla (Sug. Beet) 1959 : No. 1 : 29–34. [Russian].

Breeding and seed production of improved sugar-beet varieties, with details on the methods employed, are discussed. Some varieties possessing desirable characteristics such as resistance to bolting, storage rot, *Cercospora* and *Erysiphe* are listed. Most have been in cultivation for some years except two monogerm varieties bred more recently, one at Jaltuškov and the other at Belaja Cerkov'.

1792 **Taking the stoop out of beet farming.**
Agric. Res., Wash. 1956 : **4** : No. 12 : p. 6.

The development by the United States Department of Agriculture of a new monogerm, disease-resistant, high-yielding sugar beet hybrid is reported.

1793 Barocka, K. H.
Die "einzelfrüchtigen" Arten der Gattung *Beta* L. im Hinblick auf ihre mögliche Verwendung zur Einkreuzung in *Beta vulgaris* L. subsp. *vulgaris* (Zucker- und Futterrübe). [**The monogerm species of the genus *Beta* L. with regard to their possible use for crossing with *B. vulgaris* L. subsp. *vulgaris* (sugar beet and mangel)**].
Züchter 1959 : **29** : 193–203.

Progeny from a cross between *B. lomatogona* and the sugar beet Schreibers N are described. These showed a wide range of variability in morphological characters during their second season of growth and much variation in the time of fruit ripening. Plants with a high proportion of monogerm seed were frequent, but plants with only monogerm seed were rare; some of the monogerm types were also early in ripening. The possible use of the monogerm species *B. nana*, *B. patellaris*, *B. procumbens* and *B. webbiana* for crosses with *B. vulgaris* is discussed, mention being made of the merits and defects of these species.

1794 **Varieties of sugar beets.**
Fmrs' Leafl. nat. Inst. agric. Bot. 1959 : No. 5 : Pp. 4.

Short notes are given describing varieties recommended and provisionally recommended in the

United Kingdom on the basis of trials carried out by the National Institute of Agricultural Botany in cooperation with the British Sugar Corporation.

1795 MATSUMURA, S.
Breeding of sugar beets by means of triploidy.
Seiken Jiho/Rep. Kihara Inst. Biol. Res. 1958 : No. 9 : 29–38.

The author discusses experience gained at the Kihara Institute for Biological Research and elsewhere in Japan concerning the performance of triploids and problems requiring attention in the commercial seed production of 3*x* sugar beet. Promising results have recently been obtained from triploids produced by crossing 4*x* Japanese varieties and disease-resistant 2*x* American varieties. Tetraploids of the American varieties GW304 and GW443 are now to be induced by colchicine treatment, for use as parents. Data are included on the frequencies of 2*x*, 3*x* and 4*x* plants found in Poly-Beta varieties introduced from Europe. Produced by using 2*x* ♂-sterile mother plants, the Dutch variety Trirave had the highest proportion of 3*x* seedlings (80%).

1796 ELLERTON, S. & HENDRIKSEN, A. J. T.
Note on the probable cause of the occurrence of tetraploid plants in commercial triploid varieties of sugar beet.
Euphytica, Wageningen 1959 : **8** : 99–103.

The commercial variety Trirave (= Triplex), produced by crossing a male-sterile diploid with a tetraploid pollinator, was found to contain 8·4% of diploids and 7·7% of tetraploids. The supposition that the tetraploids arose through the fertilization of unreduced egg cells was supported by the observation that, when pollinated by diploids, the male-sterile diploids produced 2·4% triploids, as determined from chromosome counts in the leaves. Since triploids were found in 13 of the 15 male-sterile diploid families studied, and none in a normal diploid, it is suggested that the production of unreduced egg cells may result from the type of cytoplasm associated with male sterility.

1797 FEDOROV, A. I.
(The earliness of sugar-beet varieties).
Sahar. Svekla (Sug. Beet) 1959 : No. 1 : 35–38. [Russian].

The yield of different sugar-beet varieties lifted late or early is discussed on the basis of experiments carried out in 1945–1947 [cf. XXIX, Abst. 4215]. The principal conclusions are that in some districts such standard varieties as R06, R632 and I1745 yield the most sugar per unit area whether lifted early or late and that in these districts there is no need for another earlier variety.

1798 FINKNER, R. E., SWINK, J. F., DOXTATOR, C. W., OLSON, R. F. & HANZAS, P. C.
Changes in raffinose content and other characteristics of sugar beet varieties during six different harvest dates.
J. Amer. Soc. Sug. Beet Tech. 1959 : **10** : 459–66.

The varieties studied in a test by the American Crystal Sugar Co., Colo., were two selections of USDA SP53–104–0, one of USDA SP5352–0 and three of American 1. Highly significant differences between varieties were obtained for root and sugar yield per acre, sucrose percentage and raffinose percentage. Intervarietal differences in galactinol content were significant at the 5% level. Highly significant differences were found between harvest dates as regards each of these characters but no significant interaction was detected between varieties and harvest dates. Raffinose content increased in a linear trend as harvest was delayed, this increase being attributable to the lower temperatures at later dates. Five of the varieties had been previously selected for high or low raffinose content and they bred true in this respect.

1799 TIŠČENKO, A. V.
(The breeding of monogerm sugar beet at the Poltava Agricultural Institute).
Sahar. Svekla (Sug. Beet) 1959 : No. 1 : 38–40. [Russian].

A monogerm sugar beet was bred from multigerm material at the above institute. In the 1955 trials it yielded 71·9 c. sugar per ha. as against 68·5 c. of the standard variety R632, the improved yield of the monogerm form being accounted for by its higher sugar content. In 1956 both varieties yielded about the same amount of sugar and the monogerm variety had again a higher sugar content but was less productive of roots. The monogerm variety is being multiplied pending the results of final trials. The breeding method consisted of late sowing of the roots of multigerm varieties in a soil with a moisture capacity of only 25–30%. This promoted the development of single-flower buds on the plants and improved self fertility by shifting the flowering period from summer to autumn when the air is cooler. The first selfed generation gave 152 plants, 72 of which bore monogerm seed, 19 multigerm and 17 seed of both kinds.

1800 Negovskij, N. A. & Tkačenko, A. A.
(Biological characteristics of planting material and seed quality of monogerm sugar beet).
Sahar. Svekla (Sug. Beet) 1959 : No. 2 : 36–37. [Russian].

Data are given on the yield of seed, rate of germination, viability and other seed properties of different biotypes of monogerm beet selected from Belaja Cerkov' in the province of Kiev. The biotypes differed in seed size, the proportion of multigerm seed balls, the mode of attachment of the seed balls, plant habit and maturation.

1801 Sanduleac, E. V.
Sfecla monogermă—remarcabilă realizare a selecţiei. **(Monogerm beet, a remarkable breeding achievement).**
An. Romîno-Soviet. : Ser. Agric.-Zooteh. 1957 : **11** : No. 6 : 25–41.

A review is given of work concerned with breeding monogerm sugar-beet, principally in the USSR.

1802 Sinjagin, I. I.
(Resources for increasing sugar-beet production and tasks of agricultural science).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 2 : 13–20. [Russian].

Various ways of increasing production, including the use of new monogerm varieties such as Jaltuškovskaja Odnosemjannaja [Jaltuškov Monogerm] are discussed. This variety yielded 458 c. roots and 85·7 c. sugar per ha. in the 1958 trials at L'gov and outyielded all multigerm cultivars except R06.

1803 Tamrazjan, L. E.
(The effect of different pollination methods upon heredity and vitality of beet).
Nauč. Trud. erevan. Univ. (Sci. Rep. Erevan Univ.) 1956 : Part 2 : 95–104 : from Ref. Ž. (Ref. J.) 1958 : No. 13 : Abst. 57200 : p. 32. [Russian].

Varietal differences in sugar beets in response to the following pollination methods were observed: (1) fertilization by the pollen of beetroot; (2) fertilization by chard pollen; and (3) fertilization by the above kinds of pollen + self pollen. All these methods included treatments with emasculation and without emasculation. The use of the above pollination methods increased variability in respect of the dry-matter content of the juice.

1804 Grin'ko, T. F.
(Studying sugar beet varieties lifted at different dates).
Sahar. Svekla (Sug. Beet) 1959 : No. 2 : 33–36. [Russian].

A table shows the sugar contents and root and sugar yields for ten varieties when lifted on 30 August and 30 September at Čerkassk. It was found that all varieties showed improvements in the above characters at the second lifting date, but varietal differences were observed in the degree of improvement, which was mainly accounted for by a higher sugar content in some varieties and by increased root yield in others. However most varieties with a high sugar yield per unit area at the first lifting date were also among the most productive at the second lifting date. For instance, V046, which topped the list on 30 August, moved down to the second place on 30 September and V031 Ulučšennaja [V031 Improved] moved up from the third place to the top. The only exception was provided by V031, which was second in yield to V046 at the early lifting date but was outyielded by several other varieties when lifted at the later date.

1805 Golden, A. M.
Susceptibility of several *Beta* species to the sugar-beet nematode (*Heterodera schachtii*) and root-knot nematodes (*Meloidogyne* spp.).
J. Amer. Soc. Sug. Beet Tech. 1959 **10** : 444–47.

In spite of their susceptibility to all of the six species and subspecies of root-knot nematodes known to occur in the USA, *B. patellaris*, *B. procumbens* and *B. webbiana* are considered to be of possible interest in sugar-beet improvement on account of their high degree of resistance to *H. schachtii* and their other desirable characters.

1806 Finkner, R. E. & Swink, J. F.
Reaction of galactinol selected beet varieties in breeding for nematode resistance.
J. Amer. Soc. Sug. Beet Tech. 1959 : **10** : 403–23.

Strains directly derived from groups of mother beets selected from the same parent (52–413) for different contents of galactinol were tested on soil heavily infested with *Heterodera schachtii* and on soil relatively free from the pest. The results from the test in 1956 were encouraging in suggesting that selection for low content of galactinol may lead to increased resistance to nematode but those from the test in 1957 were not. Selection for galactinol content on the basis of percentage in the dry matter in the juice appeared to be more effective than selection according to percentage in the beet. In laboratory tests the degree of wilting caused by a suspension of larvae in water was considerably less for low galactinol selections in both years.

1807 JENNINGS, D. L.
***Manihot melanobasis* Müll. Arg.—a useful parent for cassava breeding.**
Euphytica, Wageningen 1959 : **8** : 157–62.

Hybrids involving cassava and the herbaceous species *M. melanobasis* were often superior to intervarietal cassava hybrids in seed set and in root yield, the superiority being maintained in subsequent back-cross generations. The straggling habit of the hybrids, which results in variation in planting material and hence in yield, was improved when the first back-cross hybrids of *M. melanobasis* to cassava were crossed with third-generation back crosses of *M. glaziovii* to cassava; the resulting hybrids were very high in yield. Tuber quality was good in the hybrids, and the high content of hydrocyanic acid could be removed by back crossing to cassava. The high protein content of *M. melanobasis* tubers did not appear to be transmitted to the hybrids.

STIMULANTS

Proceedings of the Second International Scientific Tobacco Congress, Brussels 1958 : Pp. 825.

1808 *Bode, O. Recherches sur le virus de la maladie des côtes brunes du tabac. (Research on the virus of the brown vein disease of tobacco). (pp. 93–96).*

Strains of the tobacco brown vein virus have caused considerable damage in West Germany, the losses being particularly great with Virginia tobaccos. At the Federal Biological Station in Braunschweig, two new varieties have shown considerable resistance to the virus in glasshouse experiments. Many species of *Nicotiana* were found to be susceptible but *N. glauca*, *N. raimondii* and *N. tomentosiformis* are not susceptible.

1809 *Cantillon, P. Le contrôle sanitaire d'une collection mondiale de variétés de tabac et l'influence du précédent cultural sur les maladies à virus. (Checking the health of a world collection of tobacco varieties and the effect of the preceding crop on the virus diseases). (pp. 97–101).*

A brief report is presented of the testing of 450 tobacco varieties for virus resistance at Gembloux. Several varieties from various countries are mentioned for their high resistance.

1810 *Endemann, W. Observations concernant la survenance de la maladie des côtes brunes dans la République Démocratique Allemande. (Observations concerning the occurrence of the brown vein disease in the German Democratic Republic). (pp. 111–14).*

The reaction of 147 varieties to the brown vein virus was investigated and about 20% of them were found to be tolerant; these varieties were mostly related to Geudertheim, Paraguay or Comstock. The V20 strain was immune. Recently a new strain of the virus has arisen and has attacked some previously tolerant varieties and V20.

1811 *Hitier, H. & Izard, C. Quelques essais de lutte contre la mosaïque du tabac. (Some experiments on the control of tobacco mosaic). (pp. 118–21).*

The hybridization experiments mentioned have been reported elsewhere [cf. XXIX, 4241]; the mosaic-resistant selections obtained from hybrids of *N. glutinosa* and from hybrids of *N. tabacum* 'Ambalema' have shown susceptibility to other viruses.

1812 *Koelle, G. La transmission héréditaire de la résistance à la maladie des côtes brunes. (Inheritance of resistance to the brown vein disease). (pp. 122–24).*

Successive generations up to and including the F_5 of the cross Havanna IIc (resistant) x Forchheimer Ogrodowi (susceptible) were studied in the field at Forchheim. Segregation into resistant strains resembling Havanna IIc and susceptible strains like Forchheimer Ogrodowi indicated that reaction to the disease is mainly under genetic control. It seems that it will be difficult to combine resistance with the good characters of a susceptible variety.

1813 *Kosmodem'jansky [Kosmodem'janskij], V. N. Tobacco virus diseases and breeding of resistant varieties in U.S.S.R. (pp. 125–31).*

Tobacco mosaic, cucumber mosaic and tomato spotted wilt viruses occur in the USSR, where studies are being made of techniques for isolating and identifying these viruses and for artificial inoculation of host plants. Naturally infected varieties of *N. rustica* have shown differences in susceptibility to tomato spotted wilt, Egiza N1459 being the most resistant. Differences in susceptibility were also noted after artificial infection by juice from diseased plants being rubbed into the leaves; resistance seems to depend on the angle of the leaves and possibly on the mechanical strength of the epidermis. So far no completely resistant varieties of *N. tabacum* or *N. rustica* have been found, but *N. glauca* is resistant and attempts are being made to hybridize this species with *N. tabacum* and *N. rustica*. Hybrids of *N. ditagla* and *N. dirugla* show that susceptibility to tomato spotted wilt is a dominant character; these hybrids are sterile but some progress has now been made in overcoming this sterility.

Of the many tobaccos tested, only Ambalema and its varieties showed resistance to tobacco mosaic. Ambalema is unsuitable for cultivation in the USSR and its resistance is a recessive character which does not protect against cucumber mosaic. *N. glutinosa*, which has dominant resistance, is more useful. From a cross of *N. tabacum* with *N. glutinosa*, the fertile amphidiploid *N. digluta* was obtained; this hybrid, which is resistant to tobacco mosaic and *Oidium*, has been used in many crosses with commercial varieties and several new oriental types with the disease resistance of *N. digluta* are now available. Outlines are given of methods used for transferring resistance to tobacco mosaic, powdery mildew and black root rot (*Thielaviopsis basicola*) to industrial varieties without losing any of the valuable characters of these varieties. Experiments are also being carried out on the production of F_1 hybrid seed resistant to tobacco mosaic.

1814 *Rave, L. Obtention de tabac résistant aux virus et spécialement au virus Y. (Obtaining tobacco resistant to viruses and especially to virus Y). (pp. 132–37).*

A brief mention is made of past and current work on this subject, special reference being made to breeding being carried out in Germany on resistance to virus Y. *N. glauca* and *N. raimondii* have shown immunity to this virus. Recent results on the mode of inheritance of factors for disease resistance are summarized.

1815 *Wan, H. Breeding tobacco for mosaic resistance in Taiwan. (pp. 156–58).*

The resistant variety Vamorr 48 was crossed with the varieties Hicks, Vesta 64, Virginia Gold and Bottom Special which are superior in yield and quality; three back crosses were made to these four varieties. So far 17 homozygous resistant strains have been selected; these resemble their recurrent parents in yield and quality, a few being superior to their parents.

1816 *Amarell, H. L'influence de la fumure, du sol et de la variété du tabac sur la transpiration des plantules de tabac. (The influence of fertilization, soil and tobacco variety on the transpiration of tobacco seedlings). (pp. 245–50).*

The eight varieties and strains studied showed differences in transpiration on four different soils. The water consumption in relation to the fresh weight of the plant was greatest for Virginia Gold A, Havanna IIc and D23–31 and least for R92–6 and O34–21.

1817 *Uzunovski, M. Reaction of tobacco variety "Prilep" on the occurrence of bassara disease under the conditions of extreme dry year. (pp. 286–90).*

In some years Prilep suffers greatly from a physiological disorder, bassara disease. Varieties with a short vegetative period are less damaged by bassara.

1818 *Schmid, K. La teneur en nicotine et la qualité du tabac. (Nicotine content and the quality of tobacco). (pp. 305–14).*

A full review is presented of the breeding for low nicotine content carried out in different countries and some physiological studies are also mentioned. It is thought that there is no correlation between the process of nicotine formation and the metabolic events determining quality and that it will be possible to breed high-quality tobaccos with low nicotine content.

1819 *Anitia [Aniţia], N. & Danau, C. Lignées roumaines de tabac à faible teneur en nicotine. (Rumanian tobacco strains with low nicotine content). (pp. 353–56).*

The new hybrid Băneasa had an average nicotine content of 0·87% during 1952–1957 whereas the content of other Rumanian cultivars varies between 1 and 2%. It is a late, semioriental type with leaves of medium size. Three superior strains were selected from Băneasa; these are Băneasa 50, 60 and 70, which respectively yield 38, 41 and 112% more than Ghimpaţi T. The nicotine content of these strains varies between 0·27 and 0·38%.

The original Băneasa came from a complex cross of Ghimpaţi T, Ghimpaţi G and two Burley hybrids resistant to mosaic. The hybrids were White Burley X with the probable pedigree, F_3(F_2(F_2WB 16 x Ambalema) x WB 16) x WB 16, and F_1(F_1(F_1(*N. digluta* x Ambalema)WBX) x WB) x WB.

1820 *Anitia* [*Aniţia*], *N. & Ille, C. La variation de la nicotine sous l'influence du milieu dans les cultivars roumains de tabac.* (*Nicotine variation under the influence of the environment in Rumanian cultivars of tobacco*). (*pp. 357–63*).

Twenty cultivars were grown under various environmental conditions and it was found that heredity and environment have equal effects on nicotine content.

1821 *Arghyroudis* [*Argyroudis*], *D. Quelques sortes de tabac pauvres en nicotine obtenues en Grèce.* (*Some tobacco varieties poor in nicotine obtained in Greece*). (*pp. 364–70*).

Two varieties which can convert nicotine into nornicotine during sun curing are described; these are TA32 selected from Tsembeli d'Agrinion and CC3 selected from Caba-Coulac. The fresh leaves of CC3 are also poor in total alkaloids but the product is of poor quality. Attempts were made to improve the quality of CC3 by hybridization with strain H64/20 of Basma, a high-quality variety rich in nicotine, and with strain R61/b of Bachi-Bagli. Also TA32 was crossed with Ypatis, another variety with high nicotine content. The F_1 hybrids showed in each case nicotine contents lower than the mean of the two parental values; this indicated that low nicotine content is partially dominant. It is thought that several genetic factors may control this character.

1822 *Bolsunov, I. & Kuhn, H. Contribution à l'étude de l'obtention de la matière première de tabac riche en nornicotine.* (*A contribution to the study of the production of raw tobacco rich in nornicotine*). (*pp. 377–85*).

The possibilities of breeding for high nornicotine content are reviewed, mention being made of some of the results obtained at Fürstenfeld, Austria, where varieties with nornicotine contents varying between 1·5 and 2·2% have been obtained.

1823 *Egri, L. L'obtention de tabacs pauvres en nicotine. Quelques considérations d'ordre biochimique.* (*Obtaining tobaccos poor in nicotine. Some considerations of a biochemical nature*). (*pp. 386–92*).

Mention is made of research on different metabolic types of tobacco. Those having a high carbohydrate content contain little nicotine and citric acid but have a high malic acid content, the inverse relationships being found in tobaccos with a low carbohydrate content. Tobaccos with high nornicotine content contain more of the oxidation products of nicotine than those which have high nicotine content. The nornicotine tobaccos have stronger polyphenol oxidase activity than the nicotine tobaccos. Graft hybridizations between different tobaccos caused changes in the proportions of nicotine and nornicotine in the lower leaves, the total alkaloid content remaining unchanged.

It is thought that in breeding for low nicotine content attention should be paid to the metabolic type, for the types differ in their reactions to environmental conditions.

1824 *Ioan, E. & Ille, C. Résultats obtenus dans la sélection du tabac Djebel en République Populaire Roumaine.* (*Lignées à faible teneur en nicotine*). [*Results obtained in the selection of Jebel tobacco in the Rumanian People's Republic.* (*Lines with low nicotine content*)]. (*pp. 396–98*).

By repeated selection, strains of Jebel [Mountain] were obtained which had nicotine contents varying between 0·09 and 0·45% during 1955–1957. In most cases the soluble carbohydrate content was over 20% and the protein content between 5 and 5%. The yields varied between 1213 and 1270 kg./ha. and were 20·5–26·2% greater than those of the cultivar Drăgăşani.

1825 *Koelle, G. The hereditary transmission of nicotine content.* (*pp. 399–402*).

Hybrids between Havanna IIc and FO were studied at Forchheim and it was concluded that these varieties differ in two factors controlling the decomposition of nicotine during curing. FO, which loses most of its nicotine during curing, has the genotype $A_1A_1A_2A_2$ and Havanna IIc, in which only a little nicotine is decomposed, has $a_1a_1a_2a_2$. The F_2 hybrids comprise plants with 4, 3, 2, 1 and 0 factors for nicotine decomposition segregating in a ratio of 1 : 4 : 6 : 4 : 1.

In 1935, 73% of the F_2 plants were free of nicotine and 27% contained nicotine but in 1954 39% were without nicotine and 61% had nicotine; in 1956 the results were similar to those of 1953. It is suggested that in 1953 and 1956, when nicotine contents were low because of the unfavourable conditions, two A factors were sufficient to decompose all the nicotine during curing but in 1954, when more nicotine was present, three A factors were required.

1826 *Kuhn, H. Technique pour le dosage spécifique de la nornicotine.* (*A technique for the specific determination of nornicotine*). (*pp. 403–06*).

The simple procedure described makes use of a specific colour reaction between nornicotine and isatin.

1827 *Latuszynski, G. Nouvelles variétés de tabac* (Nicotiana tabacum *L.*) *à faible teneur en nicotine cultivées à Pulawy en 1949–56. [New varieties of tobacco* (N. tabacum *L.*) *with low nicotine content grown at Pulawy in 1949–56*]. (*pp. 407–21*).

Strains with a low nicotine content have been selected from a cross between Virginia Gold and Multan 27; the variety Multan 27 originates from a cross of *N. fructicosa* x *N. macrophylla* x *N. havanensis.* These strains are superior to Virginia Joyner in yield and produce fewer suckers; also they are resistant to *Thielaviopsis basicola.*

1828 *Onishi, I. Recent studies on the tobacco with low nicotine content.* (*pp. 422–25*).

In the Cherry Red strain of the Virginia variety Bright Yellow a considerable amount of nicotine was converted into nornicotine during curing but this did not occur in the Red Free strain of the same variety; the two strains have similar total alkaloid contents. A series of Japanese tobaccos were analysed after curing by various methods. Ibusuki had a high nornicotine content and Enshu was classified as a semi-nornicotine type; these two tobaccos have reddish leaves like those of Cherry Red. The other Japanese strains had less nornicotine, the content being about 0·2% of the dry weight. Strains of the Matsukawa type had low nicotine contents.

1829 *Izquierdo Tamayo, A. & Durán Grande, M. Quelques problèmes de la mitose chez* Nicotiana. (*Some problems of mitosis in* Nicotiana). (*pp. 755–67*).

The maximum number of nuclei observed in nondividing root-tip cells was respectively eight and 14 for 2*n* and 4*n* plants of *N. rustica*, the corresponding numbers being four and eight for 2*n* and 4*n N. tabacum.* During anaphase in 2*n* and 4*n N. rustica*, some abnormalities, including fragmentation, bridge formation and lagging chromosomes, were observed. Mitosis appeared to be slower in the tetraploids than in the diploids.

1830 *Mangin, H. Essais d'amélioration par hybridation des variétés algériennes de tabac.* (*Attempts at improving Algerian tobaccos by hybridization*). (*pp. 768–77*).

Illustrated notes are provided on some new hybrids bred at Isserville. Amongst the oriental tobaccos, only the hybrids of Banat appear promising; these have satisfactory hardiness and are superior in quality.

1831 HENDERSON, R. G.
Performance of tobacco varieties and breeding lines tested in Virginia in 1957.
Res. Rep. Va. agric. Exp. Sta. 1959 : No. 14 : unpaginated.

Tabulated information is given on the plant characteristics and performance of varieties and breeding lines of flue-cured tobacco and other types tested in several localities. The results of tests for black-shank resistance at the Tobacco Disease Research Station are also summarized.

1832 GERSTEL, D. U.
Segregation in raw allopolyploids in *Nicotiana.*
Genetics 1959 : **44** : p. 513. (Abst.).

Test-cross segregation ratios for four loci in 6*x* *N. tabacum* x *N. tomentosiformis* were as follows: *Yg*, 4·5 : 1; *Ws*, 3·4 : 1; *Pb*, 3·2 : 1; and *Yb* (linked with *Pb*), 3·1 : 1. Reciprocal crosses give similar results. The comparable data for 6*x N. tabacum* x *N. otophora* were: *Yg*, 14·5 : 1; *Pb*, 10·0 : 1; *Yb* (linked with *Pb*), 8·3 : 1; and *Fs*, 5·2 : 1. Thus, in the former combination, segregation was essentially autopolyploid, whereas in the latter some preferential chromosome affinity may be suspected. Certain complications were noted, such as ratios smaller than those obtainable from chromatid segregation in the first amphiploid. It is suggested that nondisjunction, chromosome elimination and possibly differential viabilities affected the results more strongly in *Nicotiana* than in *Gossypium* [cf. XXIX, 3363].

1833 KRISHNAMURTY, K. V. & BHAT, N. R.
The cytogenetics of the amphiploid *Nicotiana glutinosa* x *N. trigonophylla.*
Indian J. Genet. 1958 : **18** : 224–37.

Cytological observations on the F_1 of *N. glutinosa* x *N. trigonophylla* and of the amphiploid (C_2), C_3 and the back cross to *N. glutinosa* are reported. The F_1 had 24 chromosomes with a mean bivalent frequency of 6·25 and a mode of six bivalents; only rod bivalents were observed. Chiasmata were only seen in end to end pairing. About 6% of the PMCs had a regular anaphase I and a similar percentage showed a regular anaphase II. Polyads of up to seven chromosomes and micronuclei were frequent. About 6% of the sporads appeared to be normal and pollen fertility was below 0·05%. In a colchicine-treated branch (C_1) of the F_1, the mean bivalent frequency was 23·62, anaphase I and II being fairly regular and pollen fertility high. The 16 C_2 plants examined showed normal chromosome pairing in all cells excepting a few where univalents were observed. The haploid chromosome number was 24 and pollen fertility was over 90%. Most of the C_3 plants also showed regular meiosis. The back cross showed a somatic chromosome number of 36; 6·18 bivalents with a mode of 12_{II} were found. Anaphase I and II and sporad formation were very irregular and only 4% of the pollen grains were stainable. Possible reasons for the lack of multivalent formation in the amphiploid are considered; the small size of the chromosomes may have been partly responsible for this.

The characters of the F_1 and C generations were compared with those of the parents. The C_2 and C_3 generations maintained the C_1 characters, no segregation being observed. The dominance relationship between characters in the interspecific hybrid was in some cases similar to that found in intraspecific *N. tabacum* crosses but in other cases the opposite relation was found. "From this it would appear that the loci involved in characters of the first category might not have differentiated appreciably while those concerned with the latter group might have differentiated though it is not improbable that the dominant species may be containing epistatic genes."

1834 Sand, S. A.

Effects on progeny segregation following chronic gamma irradiation of the mutable *V* and stable *R* loci in a clone of Nicotiana.

Genetics 1959 : **44** : p. 533. (Abst.).

Clone S5230–5, of interspecific-hybrid origin, is heterozygous for the mutable locus $V(v_{S3}/v_s)$ and for the stable locus $R(R/r)$, both of which affect flower colour. The somatic effect of chronic γ irradiation upon the two loci was determined by counting speckled sectors, indicative of change from the v_{S3} to v_s phenotype, and purple sectors, indicative of change from the R to r phenotype. Similarly, the germinal effect was studied by counting individuals with speckled and purple flowers in progeny from the treated plants. For doses below 12 r. per day, the curve for somatic response of the mutable locus was about ten times greater in slope than that for the somatic response of the stable locus [cf. XXV, 3290]. The curves for germinal response were however similar for both loci. Irradiation with not more than 10 r. per day increased the frequency of recessive individuals in the progeny. The observations on the somatic and germinal responses suggest "(1) a mutational component of effect, and (2) a buffering system against mutation, sensitive to damage by low dosage rates of irradiation. The similar progeny segregation responses indicate equal potential mutability of v_{S3} and R under conditions that remove secondary stabilizing influences."

1835 **New burley tobacco.**

Crops & Soils 1959 : **12** : No. 1 : p. 21.

Ky9, developed at the Kentucky Agricultural Experiment Station, equals Ky61 and Burley 21 in disease resistance, being resistant to black root rot, mosaic and wild fire. It has a larger leaf than Burley 21 but does not equal this variety in quality.

1836 Mahnovskij, S. P., Dremajlova, N. G. & Burcev, Ju. A.

(Technological evaluation of the raw material of new *Nicotiana rustica* varieties).

Tabak (Tobacco) 1959 : No. 4 : 36–38. [Russian].

The technological properties of the stems and leaves of seven new varieties were investigated in the Ukraine. Among the late ripening forms, Malopasynkovaja 2 [Few-laterals 2] proved superior to Hmelovka, while among the early varieties Poltavčanka 348 (tobacco from Poltava 348) and Malopasynkovyj Pehlec 4 had higher quality than the standard variety Vysokoroslaja Zelenaja 317 [Tall Green 317].

1837 Powell, N. T.

The nature of the black shank-root-knot disease complex in flue-cured tobacco and its control by breeding for resistance to both pathogens.

Diss. Abstr. 1959 : **19** : LC Card Mic 59–348 : 2709–10. (Abst.).

Using Bel 4–30 and Bel 5–56 as sources of resistance, resistance to *Meloidogyne incognita* and *M. incognita acrita* has been incorporated into Dixie Bright 101 and Coker 139. Data from back crosses inoculated with *M. incognita acrita* indicated that resistance depended on a single dominant gene or a member of "a block of genes behaving as a single dominant factor." The incidence of black shank (*Phytophthora parasitica* var. *nicotianae*) was significantly higher among root-knot susceptible back-cross segregates inoculated with both nematodes than among resistant segregates under the same conditions. When root-knot susceptible and resistant segregates were inoculated with the fungus only, they showed no appreciable disparities in black-shank infection. The black-shank pathogen apparently had an affinity for hypertrophied and hyperplastic areas of the galled roots [cf. XXIX, 237].

1838 SIEGEL, A.
The induction of mutations of tobacco mosaic virus with nitrous acid.
Genetics 1959 : **44** : p. 535. (Abst.).

The results obtained by Gierer and Mundry [XXIX, 1206] on the induction of mutations of the above virus or its isolated nucleic acid by nitrous acid were confirmed. In addition, the following observations were made. (1) Size of local necrotic lesion on *Nicotiana glutinosa* was a highly mutable character. For every three events leading to inactivation of a particle, about one event occurred which resulted in a small-lesion producing particle. This type of mutation appeared to be unidirectional, no isolates producing lesions larger than the control being found. (3) Other types of mutant features were an alteration of symptom in tobacco plants and a change from systemic invasion to necrotic lesions in *N. sylvestris*. Their total frequency suggested at least one mutational event for every two lethal ones. (3) No mutants were obtained with altered protein, as judged by serological specificity and isoelectric point, even after treatment which gave a 94% frequency of "biological" mutants. (4) Strains of the virus differed in susceptibility to mutation with nitrous acid.

1839 SCHMELZER, K. & KLINKOWSKI, M.
Die Reaktion einiger Tabaksorten und Differentialwirte gegenüber den Viren der Tabakätzmosaik-Gruppe. Zugleich ein Beitrag zur Kenntnis der Stämme des Kartoffel-Y-Virus. **(The reaction of some tobacco varieties and differential hosts towards the viruses of the tobacco etch mosaic group. In addition a contribution to knowledge of the races of the potato Y virus).**
Züchter 1959 : **29** : 229–37.

When tested with 15 viruses not belonging to the etch mosaic group, the line V20 of *Nicotiana tabacum* and the variety Virgin Gold A showed similar reactions to each virus. The reaction of 12 varieties and lines to the viruses of the etch mosaic group is reported; this group includes potato viruses Y and A. The tests were carried out in the greenhouse and the plants were artificially infected. Some resistance to certain strains of the brown vein virus was shown by nine of the varieties and these plants were not attacked by isolates of virus A which had been grown on *N. tabacum*. The line V20 showed resistance to several strains of brown vein virus and was also completely resistant to two strains of normal virus Y and the necrotic fleck virus. This line and Ergo and 032, which are also resistant or partially resistant to several Y strains, are considered to be useful breeding material.

Mainly with reference to the reactions of the tobaccos Samsun and V20, the *Solanum demissum* hybrid A6 and *Physalis floridana*, virus Y was classified into eight races and virus A into two.

1840 BAHTADZE, K. E.
(The method of breeding tea cultivars).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1959 : No. 1 : 21–28. [Russian].

Breeding tea varieties in Georgia differing in biochemical properties, size of leaf and degree of winter hardiness is discussed. The results are cultivars Georgian 1, Georgian 2, Severnyj [Northern] and several others which surpass commercial strains in quality and yield. Severnyj is distinguished by great hardiness. A recent trend has been to mix the seed of these cultivars for joint sowing in clusters to build up artificial populations, which it is thought will be even more productive and vigorous than the above cultivars. Three populations are now available for different climatic zones.

1841 HVITIJA, R. A.
(Supplementary pollination with pollen mixtures in the seed production of tea).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1959 : No. 1 : 32–35. [Russian].

The effect of different methods of pollination upon seed production of the China-type cultivar 6 was studied at the Čakvi Branch of the All-Union Tea Institute. The best pollen mixtures were (1) cultivar 6 + 13–15% of pollen of Indian or Japanese teas, and (2) cultivar 6 + 16–18% of *Camellia sasanqua* pollen. Other pollen mixtures also improved seed production by comparison with selfing or open pollination.

1842 PORTÈRES, R.
Valeur agronomique des caféiers des types Kouilou et Robusta cultivés en Côte d'Ivoire. (**The agronomic value of coffees of the Kouilou and Robusta types cultivated in the Ivory Coast**).
Café, Cacao, Thé 1959 : **3** : 3–13.

Both the Kouilou and Robusta types of *Coffea canephora* are grown in the Ivory Coast, the former being derived largely from wild populations, the latter from introduced material. In this article, short surveys of the morphological, physiological and agronomic characters of the two groups and of their disease resistance are followed by descriptions of the Kouilou and five Robusta varieties, all commonly grown in the region. Varieties in the two groups are compared with respect to resistance to various diseases, drought tolerance and cultural requirements and their suitability to cultivation in different areas is considered.

1843 VYLE, L. R.
Chocolate flavour: its assessment and speculation as to its probable origin.
Trop. Agriculture, Trin. 1959 : **36** : 287–98.

This review is an attempt to reconcile practical knowledge of the flavour of the main types of cacao with recent advances in the chemistry of fermentation and the aroma. Information on existing collections of breeding material and on small and large-scale methods of fermentation suitable for use in tests of flavour is included.

1844 ANDERSSON, G.
Svalöfs original Flora II vallmo. (**The Svalöf original poppy Flora II**).
Sverig. Utsädesfören. Tidskr. 1959 : **69** : 231–36.

Flora II, selected from the F_5 of the same cross as Flora I [cf. XXIII, 2893], is more uniform, yields 6% more seed and has stronger stems but is similar in other characters.

1845 DAVIS, E. L.
Production of seedless hops by interspecific pollination.
Nature, Lond. 1959 : **184** : p. 1336.

As compared with the unpollinated controls, cones of *Humulus lupulus* 'Late Clusters' pollinated by *H. japonicus* had longer bracts, bracteoles and internodes and fewer nodes. Pollination brings the indeterminate apical growth of the cone to a halt. The length of time during which such growth continues without pollination differs according to variety, being longer in a variety such as Late Clusters than Fuggles. These facts help to explain the difference among varieties in the influence of pollination upon yield.

MINOR CROP PLANTS

1846 GHISLENI, P. L.
Indirizzi per il miglioramento genetico delle forme di peperone diffuse in Piemonte. (**Directions for the genetical improvement of the forms of red pepper common in Piedmont**).
Allionia, Torino 1958 : **4** : 25–35.

The technique of selecting existing varieties for such characters as disease resistance, vegetative period, yield and quality is outlined.

1847 MARTIN, J. A. & CRAWFORD, J. H.
Carolina hot pepper.
Circ. SC agric. Exp. Sta. 1958 : No. **117** : unpaginated.

Notice is given of a variety released for trial production in 1954. Pods are borne well above soil level and, at maturity, the calyx separates easily. Pods are bright red, and curing at 150° F. is recommended for maximum colour retention. The variety is resistant to root knot nematodes, mosaic and fungal diseases. Yields have been good over the past ten years.

1848 OHTA [OTA], Y.
Characteristics of red peppers (*Capsicum annuum* L.) collected in Afghanistan and Iran.
Seiken Jiho/Rep. Kihara Inst. Biol. Res. 1958 : No. **9** : 23–28.

Lines derived from one collection from Afghanistan and another from Iran are compared with the Japanese varieties Takanotsume [Hawk's Claw] and Ojishi with respect to characteristics of the plant, stem, leaf and flower. The material is expected to be useful in breeding hotter varieties for Japan.

1849 HIROSE, T.
(**Intervarietal differences in the resistance of red pepper to waterlogging**).
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1958 : No. **10** : 127–32. [Japanese].

In pot experiments involving Japanese and North American varieties, few differences were observed in shoot retardation following submersion in water but marked differences were noted in recuperation. The varieties least damaged were the Japanese peppers Takanotsume [Hawk's Claw] and Fushimiama [Fushimi Sweet].

1850 OYOLU, C.
***Capsicum* species in West Africa.**
Nature, Lond. 1959 : **184** : 1163–64.

On the basis of number of pedicels per leaf axil, corolla colour and degree of crossability between *C. sinense* and *C. frutescens*, it is suggested that at present the allocation of West African representatives of the genus should be restricted to *C. annuum* and *C. frutescens* [cf. XXIX, 4270].

1851 RUSZKOWSKI, M.
Studia nad nową rośliną oleista, drapaczem lekarskim (*Cnicus benedictus* Gaert). Morfologia, biologia, agrotechnika i ocena wartości użytkowej. [**Studies on a new oil plant, the blessed thistle (*C. benedictus* Gaert.). Its morphology, biology and culture and an appraisal of its usefulness**).
Ann. Univ. M. Curie-Skłodowska : Sect. E 1957 : **12** : 319–60.

The variation in stem, leaf and inflorescence characters, growth, seed yield, seed size and oil content found among forms collected from various European countries offers scope for breeding in *C. benedictus*. The oil content of the seeds may reach 32%, the oil being superior to that of safflower in technological properties. Both self and cross pollination may occur.

1852 NIRMAL SINGH MAINI, GURSHAM SINGH & KULDIP SINGH LOBANA
Toria Abohar—a new promising strain for the Punjab.
Indian Oilseeds J. 1959 : **3** : No. **4** : 234–36.

Mass selection methods have resulted in the development of a new toria variety, Toria Abohar. It matures evenly, gives a high yield and is recommended for irrigated regions.

1853 SINGH, S. N.
Self-incompatibility studies in toria.
Indian J. Genet. 1958 : **18** : 206–09.

Pod set was 100% after artificial crossing and open pollination. In some plants, the average pod set after natural and artificial selfing was 17·91 and 54·28% respectively. Two other plants were respectively 100 and 68·09% self incompatible. When the stigma was scratched before selfing, there was an increase in pod and seed formation in both of these plants and removing the upper third of the stigma caused an even greater increase in pod and seed formation. Hence it is concluded that the growth of self pollen is inhibited in the upper layer of the stigmatic tissue.

1854 RAI, U. K. & NAIR, G. G.
Breeding value of radiation-induced morphological mutants of *Brassica juncea* L.
Indian Oilseeds J. 1959 : **3** : No. **4** : 237–44.

The exploitation of two X-ray-induced mutants of *B. juncea* 'Rai 5' is discussed. The mutants are Appressed Pod (APM) [cf. XXIX, 2972] and Thickened Pod (TPM). While both mutants were inferior to Rai 5 in number of pods, size of seed, number of seeds per pod, percentage of fertile seeds and oil percentage, the mutant TPM produced seeds heavier than those of either APM or Rai 5. The presence in both mutants of nonshattering pods enhances their suitability as breeding material.

In all three types eighteen bivalents were observed, and in each case the modal meiotic configuration in the pollen mother cells was 9_{II} with one chiasma + 9_{II} with two chiasmata. The terminalization coefficients and chiasma frequency did not differ significantly between the three types. The percentage of sterile pollen grains was lower in the mutants than in Rai 5, but the percentage of sterile seeds was higher. It was therefore suggested that the mutants should be used as pollen donors.

1855 TORSSELL, B.
Hardiness and survival of winter rape and winter turnip rape.
Växtodling 1959 : No. 15 : Pp. 168.

Applying the results of this investigation to breeding, it is concluded that the type of plant to be aimed at should combine the short internodes, dense and low leaf arrangement and contractile behaviour of the hypocotyl and roots of turnip rape with the high yield and hardiness of the tissues of swede rape.

1856 Bericht over rassenkeuze. Winterkoolzaad 1959. (**Report on choice of varieties. Winter rape, 1959).**
Zaadbelangen 1959 : **13** : p. 254.

[Cf. 673].

1857 MANNER, R.
On plant breeding methods of winter rape.
Z. Pflanzenz. 1959 : **41** : 395–412.

The initial material used in a study carried out at the Gulläker Plant Breeding Institute, Hammenhög, comprised two populations designated A and B of the varieties Regal and Matador respectively. The performances of the following were compared; the original populations, single plant progenies from the best selections of A and B, two mixtures of A progenies (AFb_1 and AFb_2), mixtures of B progenies (BFb_1 and BFb_2), a mixture of A and B progenies ($A + B\ Fb_1$), an open pollinated generation of $AFb_1(APO_1)$, a similar generation of BFb_1 (BPO_1) and a mixture of the last two ($A + B\ PO_1$).

The PO_1 mixtures gave considerably higher yields of seed and crude oil than the Fb_1 and Fb_2 mixtures and the difference is thought to be the result of heterosis in the PO_1 generations. The average performance of the PO_1 generations for seed yield, crude oil content and yield and 1000-seed weight was in each case very similar to that of the mean of the single plant progenies in the mixture. The average performance of Fb_1 and Fb_2 mixtures in seed yield and crude oil yield did not agree with values predicted on the basis of the performance of single-plant progenies included in the mixtures. In the case of A, mixtures between the best single-plant progenies gave yields of seed and crude oil very similar to those of the original population and the oil content tended to be higher in the mixtures. The B mixtures tended to give better yields of seed and oil than the original B population. Mixtures containing both A and B single-plant progenies gave on an average higher yields of seed and oil and a higher oil content than A and B. All the mixtures compared poorly with the best lines in respect of seed and oil yield.

These results are discussed in relation to the breeding methods commonly used; it is thought that it may be possible to breed mixtures which are superior in performance to the original population. If it were possible to increase cross pollination, it might be possible to produce mixtures equalling the best lines in general performance.

1858 OGAWARA, S.
(Studies on the vegetative propagation of rape).
Hiroshima Nogyo Tanki Daigaku Kenkyu Hokoku/Bull. Hiroshima agric. Coll. 1959 : **1** : No. 2 : 5–6. [Japanese].

A method of maintaining rape lines by repeated grafting on cabbage, kale or cauliflower is described.

1859 CRAIG, B. M. & WETTER, L. R.
Varietal and environmental effects of rapeseed. II. Fatty acid composition of the oil.
Canad. J. Pl. Sci. 1959 : **39** : 437–42.

Seven varieties of rape, Golden, Argentine, Regina II, Swedish, Gute, Arlo and Polish, were grown at each of seven research stations in Western Canada and their fatty-acid composition analysed by gas-liquid phase chromatography.

While station averages showed little variation, significant varietal differences were found in the amounts of oleic, linoleic and erucic acids. The seven varieties were placed in high, medium and low categories with regard to erucic acid content.

1860 LÖÖF, B.
Ekonomiskt viktiga sjukdomar på korsblomstriga oljeväxter och möjligheterna till deras bekämpning speciellt genom resistensförädling. (**Economically important diseases of Cruciferous oil crops and possibilities of control, especially through breeding for resistance**).
Sverig. Utsädesfören. Tidskr. 1959 : **69** : 237–50.

Alternaria spp. are common on rape and although little breeding for resistance has been done yet, clear differences in severity of attack on different varieties have been observed. Attack by *Botrytis cinerea* is generally secondary, following an infection by other pathogens; early varieties tend to escape infection. In breeding for resistance to *Plasmodiophora brassicae*, several physiological races have been found, some of them confined to individual *Brassica* species, others attacking several; swede rape appears to be more resistant than turnip rape. *Peronospora brassicae* also comprises several races, and varietal differences in resistance to this pathogen have been established in autumn swede rape. Many races of *Albugo candida* occur but cause little damage in Sweden. *Sclerotinia* and *Typhula* species are of importance in northern regions, but so far little breeding against them has been carried out.

1861 CANECCHIO FILHO, V. & TELLA, R. DE
Melhoramento de mamoneira (*Ricinus communis*, L.). V. Quarta série de ensaios de variedades anãs—1953/1954. [**Breeding the castor oil plant (*R. communis* L.). V. Fourth series of trials of dwarf varieties, 1953–54**].
Bragantia 1958 : **17** : 101–07.

In trials of six dwarf varieties at four localities in São Paulo, IA-38 yielded most in each place; differences according to soil type were found.

1862 JARRY, A.
Le ricin au Dahomey. **(The castor oil plant in Dahomey).**
Oléagineux 1959 : **14** : 641–45.

Two local perennial varieties, Ouidah 6 and S367, were selected for high yield and suitability for mechanical dehusking. Of three introduced varieties, R63 (from Cambodia) and Rouge de Fez [Fez Red] and Oued Beth (from Morocco), only R63 proved insensitive to climatic variations during flowering. Selection from this variety is in progress.

To improve the suitability of Ouidah 6 for mechanical dehusking by selecting for larger seed with thinner shells, this variety was crossed with both the Moroccan varieties, the progeny being back crossed to Ouidah 6. The offspring of the Oued Beth cross, which have been back crossed twice, are now in the sixth generation and distribution will begin in 1960. In the Rouge de Fez cross, progenies from one and two back crosses are being followed separately.

A first selection has been made from the cross S367 x R63 with the aim of inducing the perennial habit in the latter variety.

1863 STEIN, H.
Spininess in *Ricinus*—a character determined by a mobile morphogenetic factor.
Bull. Res. Counc. Israel : Sect. D. 1959 : **7** : p. 113. (Abst.).

The recessive gene *s* determines absence of spines on the capsule, number of spines in *Ss* plants being much lower than in *SS*. A new allele, s^f, also results in lack of spines. Number of spines in Ss^f plants is however much lower than in *Ss*. In Ss^f, spine number varies widely according to age of the plant and raceme position, suggesting that a substance regulating number may be produced in the vegetative parts.

1864 STEIN, H.
Colour inheritance in *Ricinus*.
Bull. Res. Counc. Israel : Sect. D. 1959 : **7** : p. 113. (Abst.).

Anthocyanin production is known to depend upon *M*. Gene m^g (green) was found to restrict anthocyanin to the young leaves, pistils and hypocotyl, while m^p (pure green) controls absence of anthocyanin from the hypocotyl and all other parts, except the seeds. Gene *ag* (anthocyanin glands) causes the appearance of gland-like, multicellular structures, embedded in the epidermis, in which anthocyanin accumulates. This gene therefore acts as an intensifier of red colour. When young, m^pm^pagag plants are completely green, but at a later stage red "glands" are abundant on the stems. Gene m^s (strong green) is usually phenotypically similar to m^p, but m^sm^sagag individuals do not develop red glands. *T* is responsible for the very early appearance of the seedcoat pattern on the young ovule. In *TTAgAg* plants, the pattern is traced out in yellow, in *TTagag* plants in red. Flavonols and anthocyanins are therefore considered to be precursors of the phytomelans in the mature seed. Gene *n* (noncoloured) decreases the amount of anthocyanin in the sepals, capsules and cotyledons. In m^gm^gnn plants (green), *n* determines white *v.* green and in *MMnn* plants bright pink *v.* reddish-brown capsules.

1865 STONE, W. J. & CULP, T. W.
Effects of diseases on castorbeans in Mississippi.
Plant Dis. Reptr. 1959 : **43** : 827–29.

No variety of castor oil plant resistant to attack by *Alternaria ricini* has been found, but Baker 296 and the ornamental strain MW-1 show the greatest tolerance.

1866 BORONJUK, V. A.
(A sesame variety with low shedding).
Priroda (Nature), Leningrad 1959 : No. 11 : 115–17. [Russian].

New uniformly maturing varieties of sesame bred at the Majak Breeding Station include Slaboosypajuščijsja 3 [Low-shedding 3], which is superior to the standard Kubanec 55 [sesame from Kuban' 55] in seed yield and resistance to shedding.

1867 DE MIRÓ DE ROSBACO, A. M. M.
Determinación de la "heredabilidad" en diversos caracteres agronómicos en lino. **(Determination of the heritability of various agronomic characters in flax).**
Rev. Invest. agríc. B. Aires 1959 : **13** : No. 1 : 5–17.

In a study of the parents and the F_1, F_2 and F_3 of a cross between a tall, high-yielding Tezanos Pinto line with large seeds and a shorter, lower-yielding Oliveros line with small seeds, intermediate inheritance was observed for seed size and height, with a tendency towards dominance of tallness. Both greater and smaller yields than were given by the parents were found in the F_2, with a slight preponderance of high-yielding types. Heritability values determined according to the method of Weber and Moorthy [cf. XXII, 3078] were 10% for yield, 15% for height and 68% for seed size. Determination of heritability of seed size from the regression of the F_3 on the F_2 gave 89%. The correlation coefficient between yield and seed size was 0·133, between yield and height, 0·408, and between seed size in F_3 plants and seed size in their F_2 parents, 0·75.

1868 Khem Singh Gill & Gursham Singh
Correlation studies in a cross between K_2, an improved variety and a local Punjab variety of linseed.
Indian J. Genet. 1958 : **18** : 210–19.

In F_2 and F_3 generations of this cross, grain yield was positively correlated with plant height, number of tillers, pods and seeds per plant and 1000-seed weight. However K_2 showed a slight negative correlation between yield and plant height and only a slight positive association between number of tillers and yield. In K_2 the number of secondary branches was important in determining yield but this was not important in the hybrids. Rust attack caused significant depression of yield, the number of pods, seeds and the 1000-seed weight being reduced. In F_2 and F_3 plants, plant height was negatively correlated with rust susceptibility and positively with number of pods and seeds but these characters were negatively correlated with 1000-seed weight. It seems desirable to select for more tillers and pods in this cross. Oil content and iodine number showed negative and significant correlation with grain yield and 1000-seed weight. It may be possible to select segregates with smaller seeds than K_2 and with similar oil content. Oil content and iodine number showed significant and positive correlation.

1869 Torge, D., Dan, A. & Voinea, R.
Comportarea unor linii și soiuri de floarea-soarelui în condiţiile naturale din R.P.R. **(The behaviour of some lines and varieties of sunflowers under the natural conditions of the Rumanian People's Republic).**
Probl. Agric., Bucureşti 1958 : **10** : No. 3 : 33–39.

Varietal trials of Rumanian and Soviet material during 1955–57 are reported, information being provided on oil yield and percentage. The Russian line VNIIMK 8931 [Oil Plants Institute 8931] performed best.

1870 Heiser, C. B. (Jun.) & Smith, D. M.
Origin of *Helianthus multiflorus*.
Science 1959 : **130** : p. 1418. (Abst.).

Study of the artificial hybrid between *H. annuus* ($n = 17$) and *H. decapetalus* ($n = 34$) has led to the conclusion that *H. multiflorus* ($n = 51$) originated in Europe by spontaneous hybridization between these two species.

1871 Olteanu, F.
Influenţa măsurilor agrotehnice asupra producţiei florii-soarelui. **(The influence of agrotechnical measures on the production of sunflowers).**
Probl. Agric., Bucureşti 1958 : **10** : No. 4 : 80–86.

It is reported that supplementary pollination has given increased yields and a lower husk content in experiments carried out in Rumania during 1949–51.

1872 Puškarskij, S. D.
(An effective method of increasing the oil content of the seed. The experiments of Academician V. S. Pustovojt).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 1 : 15–24. [Russian].

An account of breeding sunflowers for high oil content, resistance to *Orobanche* and short growth period at Krasnodar is given. Appreciable increases in oil content and improvements in other desirable characteristics of such older varieties as VNIIMK 8931 [Oil Plants Institute 8931] and VNIIMK 3497 were obtained by continuous selection, and the new varieties Peredovik [Advanced] and Smena [Change] have been bred. These last two have an oil content of the order of 51% and yields of 24·7–24·9 c. seed and 11·03–11·10 c. oil per ha. and are superior in these respects to the improved varieties VNIIMK 8931 and VNIIMK 3497. Peredovik has a growth period of 93 days and Smena 92 days and their husk content is 22·9%, lower than that of all the older varieties.

1873 Jdanov [Ždanov], L. A. & Alekseev, A. P.
Hibridarea vegetativă a florii-soarelui. **(Vegetative hybridization of the sunflower).**
An. Romîno-Soviet. : Ser. Agric. 1957 : **11** : No. 3 : 43–55.

[Cf. XXVII, 4279].

1874 Davidov, L.
The Giant sunflower.
Indian Agric. 1959 : **3** : 48–49.

Mention is made of a new tall sunflower variety Gigant-549 [Giant 549] developed at the USSR Institute of Plant Breeding at Puškino near

Leningrad. Good fodder yield and good quality silage are reported.

1875 Pinthus, M. J.
Seed set of self-fertilized sunflower heads.
Agron. J. 1959 : **51** : p. 626.

In an experiment at Nve-Yaar, Israel, heads isolated by parchment-paper bags yielded adequate amounts of seed for breeding purposes when selfed in late autumn, although only a very few seeds were secured from heads selfed earlier in the season. It is accordingly suggested that breeders may take advantage of cool seasons to obtain sufficient seed by selfing.

1876 Dubljanskaja, N. F.
(Determining the oil content of sunflower seed).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 1 : p. 73. [Russian].

A steel mortar with a detachable bottom has been designed at the Oil Plants Institute for testing sunflower seed without dehusking. The ground seed is analysed for its oil content by Ryškovskij's method. The new technique is quick, labour-saving and is suitable for analysis where information on husk content is not required.

1877 Jackson, R. C.
Two new species of Helianthus from New Mexico.
Madroño, S. Francisco 1959 : 54–57.

Two new species, *H. heiseri* and *H. crenatus*, related to *H. ciliaris* are described. In *H. crenatus*, $n = 17$, in contrast to $n = 34$ and 51 in *H. ciliaris*. Some variants of *H. crenatus* may be a consequence of past hybridization with an unknown species.

1878 Săvulescu, A., *et al.*
Cercetări asupra metodelor de combatere a putregaiului florii-soarelui produs de ciuperca *Sclerotinia sclerotiorum* (Lib.) De Bary. **[Researches on methods of combating the sunflower rot produced by the fungus *S. sclerotiorum* (Lib.) de Bary].**
Anal. Inst. Cerc. agron. Romîn. 1957 (1958) : **25** : No. 6 : 517–35.

All the varieties studied in this investigation were susceptible to this pathogen, the least affected being Negre de Cluj [Cluj Black] and Vărgate de Cluj [Cluj Striped].

1879 Gilbert, N. W. & Black, D. S.
Canaigre . . . a potential domestic source of tannin.
Prod. Res. Rep. US Dep. Agric. 1959 : No. 28 : Pp. 32.

This report includes a section on breeding of canaigre (*Rumex hymenosepalus*) in the USA. Selections with good root shape, 34–39% tannin content and 64–66% extract purity have been obtained from wild collections. Colour of the roots in cross-section has been used as a general guide in selecting for tannin content, slightly pink roots having a higher content than the predominantly yellow. Colour gradations within the pink range are not of use in predicting tannin content. Inbreeding to produce less variable plants has in most cases caused loss in vigour. When sufficiently homozygous lines have been produced, it should be possible to develop F_1 hybrids. In addition, many crosses have been made between plants with high tannin content, desirable root shape or good seed production to provide material for selection.

1880 Albors Yoldi, E.
Contribución al estudio y producción de alcaloides en el género Atropa. **(Contribution to the study and production of alkaloids in the genus *Atropa*).**
Farmacognosia 1958 : **18** : 295–401.

Three plants obtained from the triple cross (*A. belladonna* x *A. lutea*) x *A. boetica*, each of them having a higher content than either parent, were selfed to give a total of 50 plants. These varied in morphology and alkaloid content, over half containing more than 0·7% alkaloids and some as much as 1·6%. Maintenance of the different types by vegetative propagation proved possible.

FRUITS AND NUTS

1881 Nybom, N.
Laboratorie-glimtar från Balsgård. **(Laboratory glimpses from Balsgård).**
Fruktodlaren 1959 : **30** : 121–22.

Brief mention is made of the search for normal diploids or tetraploids among seedlings of the triploid Gråpäron [Grey pear], to be used in the development of varieties with the aroma of Gråpäron but without its disadvantages.

It is also noted that paper chromatographic analysis has shown that sour cherry contains a pigment absent from sweet cherry but present in *Prunus fruticosa*, the two latter species being the putative parents of the first.

1882 Bordeianu, T. & Constantinescu, G.
Realizările în pomicultura și viticultura din R.P.R. în ultimii 10 ani pe baza experienței sovietice. (**Achievements in fruit growing and viticulture in the Rumanian People's Republic in the last ten years on the basis of Soviet experience**).
An. Romîno-Soviet.: Ser. Agric. 1957 : **11** : No. 3 : 65–73.

This review of horticulture in Rumania includes an account of such breeding work as the study of land races of numerous species of fruit trees, clonal selection of vines, and extensive hybridization work with fruit trees and vines.

1883 Sydykov, T.
(**Horticulture in the Tien-shan mountains**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 7 : p. 69. [Russian].

Breeding apple, pear, cherry, plum and black currant for winter hardiness is reported from Naryn, Kirgizia. The results include an apple variety, Pervenec Tjan'šanja [Tien-shan Firstborn], which is outstandingly hardy and produces smallish fruits of pleasant flavour. Other material possessing breeding value is mentioned.

1884 Gherghi, A.
Studiul fizico-chimic al fructelor de cireș, vișin și arbuști fructiferi din bazinul pomicol Bistrița. (**The physico-chemical study of the fruits of sweet and sour cherry and bush fruits in the fruit-growing basin of Bistrița**).
Anal. Inst. Cerc. agron. Romîn. 1957 (1958) : **25** : No. 6 : 399–418.

Pomological descriptions, including data on taste, aroma, sugar content and acidity are given for varieties of sweet and sour cherry, strawberry, raspberry, blackberry, gooseberry and red and black currant grown in the above region.

1885 Sikka, S. M.
Breeding of fruit plants in India.
Indian J. Hort. 1959 : **15** : 10–18.

Modern methods which have been used in breeding fruit crops in various countries are reviewed, with reference to their applicability in India.

1886 Gogoleva, V. M.
(**The effects of initial form and training upon development of fruit properties in apple hybrids**).
Bjull. naučno-teh. Inform. centr. genet. Lab. Mičurin. (Bull. sci.-tech. Inform. Mičurin centr. genet. Lab.) 1957 : No. 3 : 64–69 : from Ref. Ž. (Ref. J.) 1958 : No. 14 : Abst. 61949 : p. 34. [Russian].

Hybrid progenies of Antonovka from pollination by Simirenko Reinette or London Pippin bore large fruits of pleasant flavour, while those from pollination by Gruševka [Pear] or Anis bore fruit of inferior quality. Training hybrids on soil dressed with mineral and organic fertilizers improved their fruit quality.

1887 Hjelmqvist, H.
On the embryology of two *Malus* hybrids.
Bot. Notiser 1959 : **112** : 453–64.

While the tetraploid form of *M. sieboldii* is a facultative apomict [cf. XXVIII, 2109], the present studies show that *M. zumi*, a diploid hybrid ($n = 17$) from *M. sieboldii* x *M. baccata* var. *mandshurica*, is amphimictic, although a slight tendency to form aposporous embryo sacs occurs in the chalazal part of the nucellus. In another tree, both aposporous and sexual embryo sacs were found, the former being generally either equal or superior in vigour to the latter. Approximate chromosome counts suggested that this specimen was a triploid. It is believed to be a hybrid between tetraploid *M. sieboldii* and the diploid hybrid *M. robusta*, the latter being, according to preliminary investigations, amphimictic. It is suggested that the degree of apomixis in *M. sieboldii* hybrids is dependent on the number of chromosomes derived from this parent.

1888 Klimov, P. D.
(**Winter hardiness and the activity of some enzymes**).
Bjull. naučno-teh. Inform. centr. genet. Lab. Mičurin. (Bull. sci.-tech. Inform. Mičurin centr. genet. Lab.) 1957 : No. 3 : 50–55 : from Ref. Ž. (Ref. J.) 1958 : No. 13 : Abst. 57187 : p. 30. [Russian].

In studies of winter hardiness of apple-pear hybrids and the back crosses of these to pear at Mičurinsk, winter hardiness was positively correlated with catalase activity and negatively with peroxidase activity.

1889 SEMAKIN, V. P.
(Clonal variability and selection of nursery apple trees).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 7 : 40–42. [Russian].

In recent studies of clonal variability in the central chernozem zone of the RSFSR many apple trees were found to have fruits of a size, shape, colour or flavour uncharacteristic of the variety. However most of these variations were unstable and often disappeared in the following year. Solitary true bud mutations in respect of fruit characters were found in Pepin Šafrannyj [Saffron Pippin], Slavjanka [Slav] and Antonovka after examining 429, 305 and 6600 trees, respectively.

1890 FISHER, D. V.
The Spencer apple.
Fruit Var. hort. Dig. 1959 : **14** : 15–16.

Later in ripening than McIntosh, Spencer (McIntosh x Golden Delicious) has high quality and stores well for a fairly long period. It may however suffer from a tendency to break down in cold storage after being grown in certain areas. It has shown this defect in British Columbia but not in Massachusetts.

1891 MCKENZIE, D. W. & MOUAT, H. M.
Freyberg, a new apple variety.
NZ J. agric. Res. 1959 : **2** : 1085–86.

This is a medium-sized yellow apple of Golden Delicious x Cox's Orange Pippin parentage. It matures at the same time as Golden Delicious and, although slightly less attractive in appearance, is of excellent flavour. It is recommended for its crisp juicy flesh and regular heavy bearing.

1892 REINKEN, G.
Über den Einfluss des Pflanzenschutzmittels Tuzet auf die Früchte und das Triebwachstum verschiedener Apfelsorten. (**On the influence of the plant protection substance tuzet on the fruits and the shoot growth of different apple varieties**).
Erwerbsobstbau 1959 : **1** : 154–56.

Treatment with tuzet improved the fruit colour of the five varieties tested and in three varieties keeping capacity was also improved. Fruit size was increased in some varieties; in Golden Delicious the yield decreased after treatment.

1893 BUTKUS, V.
1955–1956 mm. žiemos šalčių poveikis obelims Lietuvos teritorijoje. (**The effect of the winter frost of 1955–1956 upon apple trees on Lithuanian territory**).
Lietuvos TSR Mokslų Akad. Darb.: Ser. B 1959 : No. 2 : 141–61.

The effects of temperatures of the order of −42° C. upon many trees belonging to 104 different varieties were studied. Among the hardiest were some Russian, North American and local Lithuanian varieties.

1894 TODD, D. H.
The apple leaf-curling midge, *Dasyneura mali* Kieffer, seasonal history, varietal susceptibility, and parasitism 1955–58.
NZ J. agric. Res. 1959 : **2** : 859–69.

Of twelve commonly grown apple varieties used in the susceptibility trials, none was either entirely immune from attack or markedly preferred. The factor which apparently determined the degree of infestation is the amount of terminal growth at the time of maximum emergence and oviposition.

1895 KEGLER, H.
Untersuchungen über Virosen des Kernobstes. I. Das Apfelmosaikvirus. (**Investigations on the viruses of pome fruit. I. Apple mosaic virus**).
Phytopath. Z. 1959 : **37** : 170–86.

Apple varieties and other *Malus* forms were assessed for susceptibility to the apple mosaic virus; six of the apple varieties were only slightly susceptible.

1896 DZJUBENKO, I. P. & AVDEEV, I. T.
(A winter variety of pear).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 7 : 70–71. [Russian].

A tree of an unidentified variety combining late maturity with winter hardiness was found in the Čerkassk province, Ukraine. The variety, which has been named Studentka [Student], is immune from diseases and fairly resistant to *Ernarmonia pomonella*. The fruits weigh 220–250 g. or even 350 g. and their flavour is good. They ripen in October and keep well till March-April.

1897 ANDREEVA, I. S.
(The capacity for rooting of pear cuttings).
Agrobiologija (Agrobiology) 1959 : No. 1 : 146–47. [Russian].

Pyrus betulaefolia had the highest rooting capacity among varieties, hybrids and species tested at Saratov.

1898 LAMB, R. C.
Testing pears for fire blight resistance.
Fm. Res. 1959 : **25** : No. 3 : p. 12.

The technique used at the New York State Agricultural Experiment Station, Geneva, in testing reaction to fire-blight inoculation under nursery conditions is described. The 40 varieties and selections tested over a period of three years have shown seasonal disparities in reaction but the results are considered to give a satisfactory comparative rating for resistance. Varieties outstandingly high in resistance have been used in breeding.

1899 KOVALEV, N. V.
Ameliorarea caisului și prunului în condițiile continentale ale Asiei Centrale. (**The improvement of the apricot and plum under the continental conditions of Central Asia**).
An. Romîno-Soviet : Ser. Agric.-Zooteh. 1958 : **12** : No. 5 : 51–61.

The principal breeding methods used for apricot have been (1) selection of hybrids resulting from intercrossing late-flowering local selections, and (2) intercrossing varieties pertaining respectively to the oriental and occidental subspecies. In the case of plums, the methods used have been (1) intercrossing varieties belonging to different ecological groups, (2) interspecific hybridization between *Prunus cerasifera* and *P. iranica*, on the one hand, and *P. salicina*, on the other, and (3) interspecific hybridization between varieties of American *Prunus* species and *P. cerasifera*. Short descriptions of some of the varieties of apricots and plums obtained by these methods are given.

1900 **Two apricots do well.**
Agric. Res., Wash. 1959 : **8** : No. 3 : p. 15.

Attention is drawn to two Turkish introductions of interest to breeders. Now under test in California, they are noteworthy for their resistance to adverse weather conditions during flowering and have in addition shown some resistance to brown rot, shot hole and bacterial canker.

1901 TARASENKO, M. T.
[**The effect of growth regulating agents (growth substances) upon the rooting of sour cherry and plum cuttings**].
Izv. Timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1959 : No. 4 : 37–62. [Russian].

In experiments at the Timirjazev Agricultural Academy, treatment with indole-3-butyric acid improved the rooting of sour-cherry and plum varieties, those varieties which responded best being noted.

1902 POTAPOV, S. P.
(**The winter hardiness of plums in the south of the province of Moscow**).
Izv. Timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1959 : No. 4 : 222–26. [Russian].

Information is provided on the nature and extent of frost injury to some plum varieties in the severe winter of 1955–56 in this region. The hardiest were Sladkoplodnaja [Sweet-fruited], Narodnaja [People's], and Sestra Zori [Sister of Dawn].

1903 BRODERICK, H. T. & HEYNS, A. J.
Black spot disease attacks plums in Western province.
Fmg. in S. Afr. 1959 : **35** : No. 8 : 8–9.

Black spot disease (*Xanthomonas pruni*) is reported from South Africa. So far, only the Japanese varieties designated Golden King, Kelsey and Gaviota have been affected.

1904 KAZMIN [KAZ'MIN], G. T.
Hibrizi noi între genurile vişin-prun. (**New intergeneric cherry-plum hybrids**).
An. Romîno-Soviet. : Ser. Agric.-Zooteh. 1958 : **12** : No. 4 : 56–60.

[Cf. XXIX, 669].

1905 ATKINSON, J. D., CHAMBERLAIN, E. E. & HUNTER, J. A.
Cherry variegation in New Zealand.
NZ J. agric. Res. 1959 : **2** : 938–44.

Cherry variegation has been observed on four varieties of the sweet cherry, Bigarreau de Mezel, Doncaster, Florence and St. Margaret's. It has also been found on two unnamed varieties of sweet cherry and on one oriental flowering cherry variety (*Prunus serrulata*).

Symptoms may occur over the whole tree or on a single branch or on a few leaves. In severe cases trees are stunted and the crop reduced. Attempts to transmit the disease to other *Prunus* species were unsuccessful. The disease is nonparasitic and probably arises from bud mutations. There is some evidence that the condition may arise on seedlings grown from seed of affected trees.

1906 Basso, M. & Natali, S.
Contributo allo studio delle cultivar di ciliegio della provincia di Pisa. (**Contribution to the study of the cherry cultivars of the province of Pisa**).
Riv. Ortoflorofruttic. ital. 1959 : **43** : 420–48, 508–40.

The results of a study of 20 cultivars are presented. Data are given on time of flowering and ripening, morphology, quality and cross compatibility. All cultivars proved self incompatible and suitable pollinating varieties are indicated. Full descriptions, with illustrations, of the cultivars are given, the varieties being arranged in order of maturity.

1907 Spina, P.
La coltura del ciliegio nella zona etnea. Ricerche sulla biologia fiorale e descrizione delle cultivar. (**The cultivation of cherries in the district of mount Etna. Research on the floral biology and description of the varieties**).
Ann. Sper. agr. 1959 : **13** : No. **4** : Suppl. : xliii–lxxxvi.

An account is given of the cultivation of cherries in Sicily, the taxonomy of *Prunus avium* and its floral biology. Data are given on the germination of the pollen of the best cultivars in artificial media and on compatibility relationships. All were self incompatible with the exception of Maiolina, which was partially self compatible. Many cultivars proved mutually incompatible and suitable pollinators for the best varieties are indicated. Pomological descriptions are given of some 30 cultivars arranged in groups according to their quality, there being 8 in the group classed as good. Synonyms and local names are indicated and the varieties are also classified according to time of flowering and ripening. The characteristics of the cultivars are illustrated by a collection of photographs.

1908 Eaton, G. W.
A study of the megagametophyte in *Prunus avium* and its relation to fruit setting.
Canad. J. Pl. Sci. 1959 : **39** : 466–76.

Since the proportion of functional egg cells decreases rapidly after anthesis, cross pollination must take place immediately on anthesis for effective fertilization.

1909 Levin, J. H., Hall, C. W. & Deshmukh, A. P.
Physical treatment and cracking of sweet cherries.
Quart. Bull. Mich. agric. Exp. Sta. 1959 : **42** : 133–41.

Cracking was investigated in the varieties Windsor, Schmidt, Bing, Napoleon and Black Tartarian. Water absorption by the fruit during heavy rain is greatest in varieties with a high sugar content. Thus, the variety Bing is more susceptible to cracking than the others. The use of chemical sprays for increasing skin elasticity is suggested.

1910 Hough, L. F. & Weaver, G. M.
Irradiation as an aid in fruit variety improvement. I. Mutations in the peach.
J. Hertd. 1959 : **50** : 59–62.

One-year-old trees of five peach varieties were exposed to chronic radiation for 8 or 20 months and at dosages ranging from 10 to 260 r. per day in the Co^{60} γ field at the Brookhaven National Laboratory, USA [cf. XXIX, 1004]. Branches bearing fruits ripening earlier than normal were induced in Fairhaven. Another tree of this variety developed a branch producing fruits later in ripening than normal and having firmer flesh, more conspicuous vascular strands in the flesh, increased spread of anthocyanin throughout the flesh beyond the pit cavity and heightened colour of the epidermis. Two mutant branches of Elberta, each ripening two weeks later than normal, and a mutant branch of Brackett with clingstone fruits were also induced. One of the Elberta mutants had appreciably firmer flesh and better quality and holds promise of becoming a commercial variety. Treatments effective in inducing mutations ranged from 10 r. per day for 8 months to 60 r. per day for 20 months. The two mutations for firmer flesh and the mutation for clingstone fruit represented changes from the dominant to recessive condition; Elberta and Fairhaven are both known to be heterozygous for genes controlling firmness of flesh.

1911 **Regina peach.**
Fruit. Var. hort. Dig. 1959 : **14** : p. 2.

Regina is a new USDA introduction developed from Sunhigh x (Admiral Dewey x St. John). Recommended for trial in central California and ripening at the same time as Redhaven, it is superior to this variety in several fruit characters.

1912 **New peach to be named "Collins".**
NJ Agric. 1959 : **41** : No. **5** : p. 4.

The Collins peach.
Hort. News NJ 1959 : **40** : p. 3457.

Collins, a new variety announced by the New Jersey Peach Council, is a medium-sized, high quality, yellow-fleshed peach which is a semi-cling when picked under optimum transport conditions and a freestone when fully ripe. It ripens in early July, a few days before Sunrise, and has practically no fruit with split pits. It is said to be one of the most productive early varieties developed at the New Jersey Agricultural Experiment Station.

Collins, previously known as NJ200, was a seedling of the cross Jerseyland x NJ188 made in 1949. NJ188 is a seedling of Raritan Rose x (J. H. Hale x Goldfinch) open pollinated.

1913 **New early peaches.**
Amer. Fruit Gr. 1959 : **79** : No. 12 : 18–19.

A new early clingstone peach, Marcus, has been released by the North Carolina Agricultural Experiment Station, State College. Average fruit diameter is 2 to 2½ inches and the fruit is relatively firm with no noticeable softening along the suture. This variety is classed as moderately vigorous and productive. It is susceptible to bacterial spot disease.

1914 **New freestone peach.**
Amer. Fruit Gr. 1959 : **79** : No. 10 : p. 9.

Suncrest (Alamar x Gold Dust), developed at the US Horticultural Field Station, Fresno, Calif., ripens 10 days earlier than Elberta and 10 days later than Redglobe and July Elberta.

1915 MORETTINI, A.
La nuova cultivar di pesco "Fertilia Morettini" (J. H. Hale x [Lord Napier x Fior di Maggio]). **[The new peach cultivar Fertilia Morettini (J. H. Hale x [Lord Napier x Fior di Maggio])].**
Riv. Ortoflorofruttic. ital. 1959 : **43** : 289–97.

The seedling described came from the same cross as that which produced Gialla precoce [Early Yellow] previously described [cf. XXVIII, 2150] but ripens somewhat later. In all other respects it resembles Gialla precoce and so serves to extend the season of this type of peach. It is more vigorous than June Elberta and other yellow-fleshed varieties that ripen at the same time, yields better and has fruit that keeps better.

1916 FEDOROV, M. A.
(Peach from the Pamir in Har'kov).
Priroda (Nature), Leningrad 1959 : No. 8 : 114–15. [Russian].

Seedlings winter hardy and drought resistant under Har'kov conditions were raised from the stones of a peach growing at 2500 m. in the Pamir. They fruited first in 1958 and ripened fruit in September. The fruits weighed 35 g. each and had a small stone and aromatic white flesh of pleasant flavour. So far the trees have been resistant to pests and diseases.

1917 PIERINGER, A. P.
Breeding programs can improve citrus fruit quality but process is slow.
Sunshine St. agric. Res. Rep. 1959 : **4** : p. 5.

A general review is given of citrus fruit breeding in Florida and California. Hybridization for improved rootstocks is discussed, and the importance of polyembryony in producing virus-free strains is mentioned.

1918 SINGH, J. P. & RANDHAWA, G. S.
Some interesting bud variations in citron (*Citrus medica* L.).
Indian J. Hort. 1958 : **15** : 19–21.

Variant fruits borne by three trees at the Indian Agricultural Research Institute, New Delhi, are described. Provided they prove stable, all the variations may be of economic value. They include a fruit resembling Kagzi lime in shape and size but completely seedless and juicy, and a lemon-shaped type.

1919 GERRITSEN, C. J.
De vijg. **(The fig).**
Meded. Inst. Vered. TuinbGewass. 1959 : No. 145 : 849–53.

In this discussion of the possibilities of fig growing in the Netherlands, it is noted that in tests at Wageningen some unprotected trees from hybrid populations were completely killed by frosts of about −16° C. in 1954–55 while others lost only the parts above ground and produced new shoots later. The latter also survived the next cold winter and are now to be tested for quality under more favourable growing conditions.

1920 SUGIYAMA, T.
On the breeding of triploid mulberry by diploidizing gamete cells (a preliminary note).
Ikushugaku Zasshi/Jap. J. Breeding 1959 : **9** : 41–45.

Buds of potted cuttings were treated with colchicine and the flowers subsequently pollinated by diploid mulberry. One of the 190 seedlings from treatment with 0·2% colchicine was triploid ($2n = 42$). It had larger stomata with a lower number per unit area of leaf than the diploid parents.

1921 CRAICIU, E.
Contribuţii la determinarea celor mai bune varietăţi du dud pentru hrănirea viermilor de mătase. **(Contributions to the determination of the best mulberry varieties for feeding silk worms).**
Anal. Inst. Cerc. agron. Romîn. 1957 (1958) : **25** : No. 6 : 703–11.

In a comparative trial of local and introduced varieties, Roz de Lombardia [Lombardy Pink] and Cattaneo proved superior as sources of nutriment for silkworms; they exceeded the other varieties tested in water content and protein level.

1922 JARRETT, F. M.
Studies in *Artocarpus* and allied genera, III. A revision of *Artocarpus* subgenus *Artocarpus*.
J. Arnold Arbor. 1959 : **40** : 327–68.

This further instalment completes the revision of the subgenus *Artocarpus* [cf. 752].

1923 BALASUBRAMANYAM, V. R. & RANGASWAMI, G.
Parthenocarpy in guava induced by 'pollen hormone'.
Curr. Sci. 1959 : **28** : 413–15.

Self pollination resulted in fruit set in the three varieties Allahabad Round, Chittidar and Lucknow. In the case of Allahabad Round, no seed production occurred and pollen viability tests showed no pollen tube production.

Pollen from Allahabad Round was ground to a paste with distilled water and filtered. The filtrate, when added to the stigma of emasculated flowers, resulted in the production of seedless fruits. Pollen from Chittidar and Lucknow was found to fertilize the ovules of Allahabad Round, giving rise to seeded fruits, but pollen from Allahabad Round failed to fertilize the other two varieties, nor was there any parthenocarpic development.

1924 LEDIN, R. B.
Mango varieties in Florida.
Hort. Advanc., Saharanpur 1958 : **2** : 16–26.

A classification of varieties in Florida according to geographical origin is followed by an account of criteria used in scoring varieties for fruit characters and orchard performance. Descriptive notes are given on 25 varieties.

1925 MALLIK, P. C., SAHAY, R. K. & SINGH, D. L.
Effect of hormones on the sex-ratio in mango.
Curr. Sci. 1959 : **28** : p. 410.

The variety Kalapady, which in its February-March flowering period produces only very few female flowers, was treated with aqueous sprays of β-naphthaleneacetic acid in 50 and 100 p.p.m. concentrations just before the onset of flower-bud production. At both concentrations the proportion of female flowers was significantly increased.

1926 SINGH, L. B.
Deblossoming in relation to biennial bearing in mango (*Mangifera indica* L.).
Hort. Advanc., Saharanpur 1958 : **2** : 9–15.

Varietal response to deblossoming was determined with the varieties Fazari Zafrani, Karania Langra, S. B. Alibagh and Dashehari. While all the varieties flowered and fruited in the off years, the first four reverted to their original biennial rhythm after only two years. Dashehari, however, did not revert to its original cropping behaviour during the nine years of the trial.

1927 SINGH, R. N.
Studies in the differentiation and development of fruit buds in mango (*Mangifera indica* L.). II. Morphological and histological changes.
Hort. Advanc., Saharanpur 1958 : **2** : 37–43.

The variety Baramasi was found to differ from five other varieties studied in both the time of initiation and the mode of development of its flower buds.

1928 RAI, J. N.
Studies in the diseases of *Mangifera indica* Linn. X. Girdle necrosis—a variation from typical mango necrosis.
Indian J. agric. Sci. 1958 : **28** : 243–47.

The simultaneous appearance of several lesions on any part of the distal end of the fruit, and their coalescence to form a girdle, are the distinctive characters of this disease. No infective organism has been isolated. The variety Khasli was found to be less susceptible than Dasehri and Safeda.

1929 Morimoto, M.
(**Investigations on the fruit types of the Saijo kaki**).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. Exp. Sta. 1958 : No. 56 : 131–42. [Japanese].

A description is given of variation in fruit shape encountered in the above kaki variety in the prefecture of Okayama. The history of the variety, which has been grown in Japan for many hundreds of years, is briefly discussed.

1930 Kawagoe, H. & Inoue, J.
(**Studies on the pollination of kaki. II. Observations on the time required for fertilization and experiments on altering the efficiency of artificial pollination**).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. Exp. Sta. 1958 : No. 56 : 153–62. [Japanese].

The time required to effect fertilization after pollination is ca. 10 hr. The effects of various additional substances acting as pollen diluents on pollen germination and fertilization were investigated; the most effective substance tried was dried skimmed milk. [Cf. XXVIII, 3368].

1931 Cociu, V. & Pandele, I.
Contribuţii la studiul nucilor cultivaţi la Sibişelul vechi, Fălticeni, Buzău şi Sibiu. (**Contributions to the study of the walnuts cultivated in Sibişel vechi, Fălticeni, Buzău and Sibiu**).
Anal. Inst. Cerc. agron. Romîn. 1957 (1958) : **25** : No. 6 : 371–97.

A detailed study of the walnuts grown in the above localities is reported. Well-defined varieties do not appear to exist but the extensive range of forms encountered provides useful material for selection. Out of 139 types collected, 31 are recommended for further study. Two types from Buzău are of special interest: 133, with a kernel percentage of 60·30% and a fat content of 68·70%; and 160, with 24% protein.

1932 le Roux, J. C.
Pecan nut industry making good progress in Natal.
Fmg. in S. Afr. 1959 : **35** : No. 6 : 10–13.

Mention is made of varieties resistant to pecan scab (*Fusicladium effusum*). Newly selected seedlings are being tested for resistance at Ukulinga.

1933 Kientzler, L.
Cas d'hermaphrodisme chez le châtaignier. (**A case of hermaphroditism in the chestnut**).
Bull. Soc. bot. Fr. 1959 : **106** : 211–12.

Castanea sativa trees in the Annecy region were found to have hermaphrodite flowers containing 12 stamens and 6 or 7 stigmas or less frequently 10 stamens and 5 stigmas. In some flowers all the stamens were normal and in others there were some staminodes in addition to normal stamens.

1934 Gerritsen, C. J.
Een hoger rendement bij de teelt van hazelnoten. (**Higher yields in hazel culture**).
Meded. Inst. Vered. TuinbGewass. 1959 : No. 149 : 105–11.

It is noted that collecting and testing of varieties are in progress at the Netherlands Institute of Horticultural Plant Breeding; rootstocks are also being tested.

1935 Casella, D.
Per il miglioramento e l'incremento del nocciuolo in Italia. (**The improvement and extension of the hazel in Italy**).
Ann. Fac. Sci. agrar. Univ. Napoli, Portici 1957–1958 : **23** : 1–22.

Details are given of the cultivation of hazels and filberts in Italy, the cultivars grown and their characteristics, with recommendations as to those most suitable for planting in different areas. The variety Mortarella is mentioned specially as combining most of the qualities desired by both growers and consumers. Certain varieties useful as pollen producers are also mentioned.

Methods of reproduction and cultivation are outlined.

1936 Milella, A.
Ricerche sulla biologia fiorale del mandorlo in Sardegna. (**Investigations on the floral biology of the almond in Sardinia**).
Riv. Ortoflorofruttic. ital. 1959 : **43** : 322–32.

Data are given on time of flowering and compatibility relationships in the main Sardinian almond cultivars. All but Francese [French], Nocciolara and Arrubia are self incompatible and all varieties benefit from cross pollination. Suitable pollinators for the cultivars studied are named.

1937 **Almonds that fit today's needs.**
Agric. Res., Wash. 1959 : **8** : No. 2 : p. 14.

Breeding for small kernels in almonds for use in the confectionary industry has resulted in the development of nine promising selections now under trial.

1938 Whitehead, C.
The rambutan, a description of the characteristics and potential of the more important varieties.
Malay. agric. J. 1959 : **42** : 53–75.

Eleven commercial varieties of *Nephelium lappaceum* are described, and information is given on the yield, quality and earliness of some of these and some additional varieties based on results obtained during 1948–59.

Recommended varieties in order of merit are: R7 (Kepala Besar); R12 ($Kelip_2$); R4 (Ya Tow); R3 (Peng Th'ng Bee) and R86 (Singapura).

1939 Raman, V. S.
Studies in the genus *Arachis*. VII. A natural inter-specific hybrid.
Indian Oilseeds J. 1959 : **3** : No. 4 : 226–28.

A natural hybrid, *A. villosa* ($2n = 20$) x *A. monticola* ($2n = 40$), is described. In the hybrid, $2n = 30$; meiotic behaviour was irregular, ten bivalents and ten univalents being formed. The hybrid was sterile.

1940 Seshadri, C. R., Bhavanishankar Rao, M. & Varisai Muhamed, S.
Studies on root development in groundnut.
Indian J. agric. Sci. 1958 : **28** : 211–15.

The root systems of bunch, spreading, semi-spreading and trailing varieties are described. Reference is made to drought resistance, and three varieties described as highly resistant (AH447), fairly resistant (AH25) and poorly resistant (AH1) are compared.

AH1 was found to have a poorly developed root system compared with the other two. Differences between AH25 and AH447, however, were not large enough to explain the greater resistance of AH447. Physiological or anatomical factors are presumed to be involved.

1941 Lin, H.
(Observations on the resistance of groundnut varieties to wilt).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China : New Ser. 1959 : No. 26 : 44–48. [Chinese].

The varieties most resistant to wilt caused by various fungal pathogens in regional tests during 1954–57 were Tainung 1, Tsingtao, Spanish White, Southern Cross, Kinorales, Chin-men and Tai-nan-pei-yu-tou 1 [Tainan White Oil Bean 1]. Varieties most resistant to inoculation with *Sclerotium* (*Pellicularia*) *rolfsii* comprised Spanish White, Southern Cross, Nung-shih H–51B–123 [Agricultural Research Institute H–51B–123] and Early Runner.

1942 Pandalai, K. M. & Pillai, R. V.
Albinism in coconut seedlings.
Nature, Lond. 1959 : **184** : p. 1163.

Evidence has been obtained that inadequate utilization of the iron already present in the leaf determines the albino condition in the coconut. Since albinism is an inherited recessive character, the inadequate functioning of the iron metabolism appears to be a process under genetic control.

1943 Suto, I.
(Anatomical observations on the seeds of seedless pomegranates).
Seiken Jiho/Rep. Kihara Inst. Biol. Res. 1958 : No. 9 : 58–60. [Japanese].

An anatomical description is given of a pomegranate with reduced lignification of the pips collected by the Kyoto University Expedition to the western Himalayas in Afghanistan.

1944 Ramirez, D. A.
Cytology of Philippine plants. I. *Averrhoa bilimbi* Linn.
Philipp. Agric. 1959 : **43** : 314–16.

A. bilimbi ($n = 12$) was normal meiotically. The caryotype was analysed with respect to centromere position and knob distribution.

1945 Storey, W. B.
Modification of sex expression in papaya.
Hort. Advanc., Saharanpur 1958 : **2** : 49–60.

Papaya trees can be divided into three primary groups, male, hermaphrodite and female. For on-the-spot identification of flower types, a working classification of eight groups is proposed.

Two independent sets of genes are postulated for sex expression, one set controlling female fertility and sterility, the other set controlling the production of normal and carpelloid stamens. The genetic factors are held to exert their effects in response to physiological stimuli accompanying change of season.

On the basis of seasonal variation in female sterility, the production of carpelloid stamens and both in combination, fifteen classes are proposed for hermaphrodite trees. Fifteen comparable classes are found among male trees. Two female forms are known, a sex-stable form and a sex-variable form. Thus thirty-two sex forms are now recognizable.

1946 Aslanov, S. R.
(Jujube, a valuable horticultural plant).
Priroda (Nature), Leningrad 1959 : No. 8 : p. 108. [Russian].

Introduction of eleven varieties of *Zizyphus sativa* from China for breeding by the Institute of Genetics and Breeding of the Azerbaijan Academy of Sciences is recommended. Recent standard varieties in Azerbaijan are listed.

1947 Haskell, G.
Selection, correlated responses and speciation in subsexual *Rubus*.
Genetica 1959 : **30** : 240–60.

Progenies of single plants of *R. nitidioides* ($2n = 28$) selected for high and low prickle number per internode or early flowering from a large and apparently constant apomictic population were subjected to biometrical analysis. Two selections (H_1 and H_2) for high and two (L_1 and L_2) for low prickle number, one selection (E) for early flowering and one unselected control were used as parents. The progenies studied were mainly those derived from natural "open pollination" and artificial "selfing." As indicated by prickle density (mean number of prickles per unit length of internode), selection had an effect only in H_1 and L_2. This result provides evidence that variation and segregation occur in subsexual apomicts as well as in sexual species. E produced progeny very early in flowering. Progenies of H_1 and E were notable for the correlated responses shown in other characters, such as reduced plant vigour, partial sterility and changes in leaf colour and shape. These associated changes were maintained in the two succeeding generations. In H_1 progenies, the associated taxonomic alterations in the leaves led to resemblances to other species in sect. *Sylvatici*. The behaviour of the selections is discussed in relation to the evolution and speciation of apomictic representatives of *Rubus*. Possibly diplospory is associated with a polytopical origin of apomictic microspecies.

1948 Markarian, D. & Olmo, H. P.
Cytogenetics of *Rubus*. I. Reproductive behavior of *R. procerus* Muell.
J. Hered. 1959 : **50** : 131–36.

Seed from *R. procerus* ($2n = 28$) when selfed under conditions in central California was very poor in germinability. The occurrence of a large percentage of maternal haploids in the selfed progenies was indicative of failure in fertilization. In addition, absence of embryo sacs in many of the drupelets was indicative of failure of the megaspore mother cell. Environmental factors may influence seed fertility, since a much higher percentage of viable seed was obtained when selfing was effected in the greenhouse. The segregation observed in selfed progenies, the production of a true hybrid from *R. procerus* x *R. louisianus* unaccompanied by false seedlings and the evidence obtained of a completely sexual type of embryo-sac development do not support earlier reports of apomixis in this species.

1949 Briggs, J. B.
Three new strains of *Amphorophora rubi* (Kalt.) on cultivated raspberries in England.
Bull. ent. Res. 1959 : **50** : 81–87.

The discovery of three distinct strains of *A. rubi* on European raspberries is discussed in relation to breeding programmes designed to produce resistant raspberry varieties.

1950 Zahrjapina, T. D.
(Differentiation in the pathogen of anthracnose of currants and gooseberries).
Bot. Ž. (Bot. J.), Moskva 1959 : **44** : 836–43. [Russian].

Strains of *Gloeosporium* (*Pseudopeziza*) *ribis* taken from red and black currant and gooseberry and from *Ribes alpinum* and other species were shown to differ in morphology, temperature requirements and the range of host species they are capable of infecting.

1951 Dijksterhuis, H. P.
Verslag van het aardbeirassenproefveld te Zeerijp over 1959, met een samenvatting over de jaren 1957, 1958 en 1959. **(Report on the strawberry trial field at Zeerijp in 1959, with a summary for the years 1957, 1958 and 1959).**
Tuinbouwber., Groningen 1959 : **14** : 217–18.

In a trial of 19 varieties at Zeerijp, Netherlands, the midseason strawberry Senga Sengana was the best of all the varieties, while Regina and Macherauchs Späternte [Macherauch's Late Harvest] were best of the early and late varieties, respectively.

1952 Darrow, G. M.
Strawberry varieties—past, present, future.
Fruit Var. hort. Dig. 1959 : **14** : 7–10.

Based on a talk presented at a meeting of the New Fruits Testing Association, held during September 1958 at Geneva, NY, an outline is given of the main achievements and aims of strawberry breeding in the USA.

1953 Soncava, M. P.
(The transmission of characters to the progeny in intervarietal hybridization of garden strawberry).
Vesci. Akad. Nauk Belorussk. SSR: Ser. bijal. Nauk (News Acad. Sci. White Russ. SSR: Ser. biol. Sci.) 1957 : No. 1 : 55–64 : from Ref. Ž. (Ref. J.) 1958 : No. 14 : Abst. 61935 : p. 33. [Russian].

Most of the F_1 plants obtained by intervarietal hybridization possessed intermediate characteristics.

1954 Dahlgren, K. V. O.
Pfropf- und Vererbungsversuche mit *Fragaria vesca* f. *micrantha*. **(Grafting and inheritance experiments with *F. vesca* f. *micrantha*).**
Svensk bot. Tidskr. 1959 : **53** : 293–98.

The *micrantha* character [cf. XXIII, 2198] could be reproduced only by means of clonal propagation and failed to appear in progenies either from selfings or from reciprocal crosses with normal-flowered forms; a tendency towards small flowers, but without the *micrantha* type of sepal, was observed towards the end of the growing period in the selfed progenies. Failure to transmit the *micrantha* character by grafting to selfed plants, to normal wild strawberries or to the white-fruited form *alba*, indicated that the condition is not caused by virus infection. Data from the crosses involving the *alba* form showed that white fruits are recessive and monogenically determined.

1955 Moore, J. N. & Varney, E. H.
Verticillium wilt of strawberries.
Hort. News, NJ 1959 : **40** : 3438–39.

Twenty commercial varieties are listed in order of resistance to *V. albo-atrum*.

1956 Maassen, H.
Beiträge zur Kenntnis der Erdbeerviren. **(Contribution to knowledge of strawberry viruses).**
Phytopath. Z. 1959 : **36** : 317–80.

Symptoms of virus disease in several varieties are described. Twenty-seven varieties were tested for virus infection. The degree of infestation of different varieties with *Acyrthosiphon pelargonii* ssp. *rogersii*, a possible vector, was also determined. Attempts were made to classify the viruses into groups according to the symptoms they produce and other characters.

1957 Gopalan Nayar, T., Seshadri, V. S. & Appaiyan, M. C.
Banana research in Madras.
Indian J. agric. Sci. 1958 : **28** : 249–55.

One hundred and forty-one varietal names have been reduced to 56 distinct varieties. These are listed in an appendix together with their synonyms.

Hybridization programmes are directed towards the production of dwarf or semitall varieties resistant to cyclone damage and to wilt and bunchy-top diseases. Observations made after the cyclones of 1952 and 1955 showed that the dwarf variety Mauritius was unaffected and the medium-tall variety Rasthali only slightly affected. While Mauritius is highly resistant to wilt, Rasthali proved susceptible.

Semitall mutants of the varieties Mons marie and Nendran are under trial.

1958 Pirovano, A.
Il miglioramento delle uve da tavola. **(Improvement of dessert grapes).**
Agricoltura, Roma 1959 : **8** : No. 10 : 36–43.

In an outline of his work on vine breeding in Italy, the author mentions that he effects pollination of emasculated flowers by means of an insufflator. By growing the seedlings in the greenhouse attacks of mildew are obviated as no dew forms; they are later grafted on to American rootstocks. The pollen in crosses has usually been subjected to treatment by an electromagnetic field or radiation. That this treatment has had some effect is assumed from the production of some unusual types such as Volta, an exceptionally early muscat, Suavis, with the aroma of roses, and Moscato Fiamma [Flame Muscat], a very fertile muscat with orange-coloured fruit. In most cases increased vigour results from crossing. Cases are referred to in which the degree of pigmentation of the progeny is in excess of that which would be expected on a simple Mendelian basis; in this way the author's Conte Rosso [Red Count], with bright red fruits, was produced; seedling 529 from Conte Rosso has fruits verging on scarlet. In some complex crosses derived from Pizzutello more than half the seedlings have pyriform fruits.

1959 Poenaru, I., Popescu, G. & Oşlobeanu, M.
Hibrizi de perspectivă pentru podgoria Odobeşti. (**Promising hybrids for the Odobeşti vineyard**).
Anal. Inst. Cerc. agron. Romîn. 1957 (1958) : **25** : No. 6 : 435–41.

The following promising new forms are described: Băbească neagră [Black Băbească] x Rupestris du Lot 21/5, a vigorous stock resistant to *Phylloxera* and frost; Galbenă [Yellow] x Armaş 13/19 and Galbenă x Traminer roz [Pink Traminer], early hybrids with high values for sugar and acidity; and three clones obtained by open pollination of Coarnă albă [White Coarnă] which differ from the mother plant in having hermaphrodite flowers.

1960 Maigonnat, A.
Les raisins de table en Tunisie. (**Table grapes in Tunisia**).
Tunis. agric. 1959 : **60** : 63–80.

With the aim of increasing production of table grapes for export, a number of early, midseason and late varieties are assessed with regard to local conditions.

An account is given of hybridization programmes undertaken by the École Supérieure d'Agriculture de Tunis before and since the War with the aim of producing improved varieties for the table, for drying, for red and white wines, and for wines of quality.

1961 Bruini, C.
Il parere di un viticoltore in tema di ibridi produttori. (**The opinion of a vine grower on the subject of producer hybrids**).
Riv. Vitic. 1959 : **12** : 345–48.

The results of tests carried out in the Modena province of Italy with a number of hybrids show that although some of the newer hybrids are superior to the early direct producers in vigour and disease resistance, none of them has proved equal to the old-fashioned wine grapes in respect of quality.

1962 Loladze, V. R.
Variabilitatea vegetativă a viţei de vie şi fixarea caracterelor modificate la descendenţi. (**Vegetative variability of the vine and fixation of modified characters in the descendants**).
An. Romîno-Soviet.: Ser. Agric.-Zooteh. 1957 : **11** : No. 5 : 45–50.

[Cf. XXVIII, 2228].

1963 Tardy, L.
Le raisin de table dans le Bassin Méditerranéen. (**The table grape in the Mediterranean basin**).
Tunis. agric. 1959 : **60** : 51–60.

This general review describes the production of table grapes, both fresh and dried, in countries bordering the Mediterranean, and gives details of the more important varieties grown in each country.

1964 Cosmo, I. & Forti, R.
"Rondinella".
Ann. Sper. agr. 1959 : **13** : No. **4** : Suppl. : cxxxiii-cxlii.

The vine described is grown in the Verona province of northern Italy for mixing with other varieties, though tests have shown that it produces a quite good wine when fermented alone.

1965 Cosmo, I. & Forti, R.
"Rossignola".
Ann. Sper. agr. 1959 : **13** : No. **4** : Suppl. : cxliii–clii.

The vine described is grown under various names in different areas of northern Italy, where it is mixed with other varieties in the production of the Bardolino and Valpolicella wines.

1966 Cosmo, I. & Forti, R.
"Nosiola".
Ann. Sper. agr. 1959 : **13** : No. **4** : Suppl. : cliii–clxii.

Grown in the Trento locality of northern Italy, this vine is used for preparing a light white wine and an altar wine.

1967 Dalmasso, G., Dell'Olio, G. & Ricci, P.
"Cortese".
Ann. Sper. agr. 1959 : **13** : No. **4** : Suppl. : clxiii–clxxii.

In addition to dessert grapes, this vine is used in northern Italy for preparing good white wines, dry, sweet and sparkling, and for mixing with others of the Barbera type.

1968 Dalmasso, G., Dell'Olio, G. & Ricci, P.
"Brachetto".
Ann. Sper. agr. 1959 : **13** : No. **4** : Suppl. : clxxiii–clxxxiv.

The vine described, thought by some to have been introduced from the locality of Nice, is used for making a sparkling red dessert wine in the Asti area of northern Italy.

1969 Cosmo, I.
Le varietà migliori e più idonee. **(The best and most suitable varieties).**
Agricoltura, Roma 1959 : **8** : No. 10 : 44–57.

The number of cultivars of dessert grapes is limited compared with the wine grapes. The dessert grapes are classified into seven maturity groups and tables are given showing (1) the cultivars suitable for the dual purpose of wine making and dessert, and the areas for which they are suited, (2) those suitable for table use alone, with indications of their maturity period, (3) local cultivars, with their areas, and (4) a number of cultivars of varying maturity period suitable for trial as dessert varieties. Brief descriptions are given of the individual cultivars, arranged according to maturity group; there follows an alphabetical list of the cultivars, with indications of their uses, maturity, colour, flavour and areas of adaptation, and finally a list is given of the main synonyms.

1970 Komarova, E. S.
Soiurile de viță de vie gruzine de perspectivă, pentru Ucraina. (**Promising Georgian vine varieties for the Ukraine).**
An. Romîno-Soviet.: Ser. Agric.-Zooteh. 1958 : **12** : No. 1 : 75–82.
[Cf. XXVIII, 934].

1971 Constantinescu, G., Negreanu, E., Lăzărescu, V., Boureanu, C. & Alexei, O.
Identitatea unor soiuri de viță roditoare cultivate în R.P. Bulgaria și R.P. Romînă. (**The identity of some vine varieties cultivated in the Bulgarian and Rumanian Peoples' Republics).**
Anal. Inst. Cerc. agron. Romîn. 1957 (1958) : **25** : No. 6 : 419–33.

Full technical descriptions are given of three varieties known respectively as Berbecel, Roșioară and Cadarca in Rumania and Kokorko, Pamid and Gîmza in Bulgaria.

1972 Aivazean, P. K.
Soiuri noi de viță de vie de perspectivă. **(New promising varieties of vine).**
An. Romîno-Soviet.: Ser. Agric.-Zooteh. 1957 : **11** : No. 4 : 63–69.

Descriptions are given of the following varieties bred at the Tairov institute in the Ukraine: Tairov (Alicante Bouché x Cabernet Sauvignon), giving a wine with a taste reminiscent of chocolate and coffee; Pervenec Ukrainy [Ukraine First-born] (of the same parentage), producing a wine of similar type to the preceding though with a less noticeable Cabernet flavour; 1–110–5 (Muscat Ottonel x Muscat negru timpuriu [Early Black Muscat]), whose wine is characterized by both muscat and lemon flavours; 1–110–62 (of similar origin to the preceding variety), a white muscat variety for dessert or wine-making; 1–121–2 (Muscat negru timpuriu x Perla de Csaba [Csaba Pearl]), a productive table-wine variety; 1–62–9 (Chasselas alb [White Chasselas] x Muscat alb [White Muscat]), with berries of Chasselas muscat type; 1–122–35 (Musquadel x Tavriz), a midseason dessert variety whose berries transport well; 14–16–29 (Sainceau x Hamburg Muscat), combining the productivity of the former parent with the better quality of the latter; 1–12–57 (Caraburnu x Hamburg Muscat), a productive variety with long berries of the Caraburnu type; 0,2–7–11–1 (Hamburg Muscat x Mathias Ianosz), a high-quality muscat type; and 13–a–17–20 (a hybrid trained on the mentor stock Riparia x Rupestris 101–14), a late variety with superior flavour.

1973 Negrul [Negrul'], A. M.
Vița de vie sălbatică din Crimeea și legătura dintre ea și soiurile locale. **(The wild vine of the Crimea and the connexion between it and the local varieties).**
An. Romîno-Soviet.: Ser. Agric. Zooteh. 1958 : **12** : No. 6 : 67–80.
[Cf. XXVIII, 4707].

1974 Negrul', A. M.
(New data on the origin of the Central Asiatic varieties of vine).
Izv. Timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1959 : No. 4 : 23–36. [Russian].

Descriptions are given of the vines found in a recent expedition in the Soviet territories of Central Asia. The great diversity of local forms leads to the conclusion that in the oases most of them have arisen from selection of seedlings, firstly from the local vines with smooth leaves and small juicy berries, and later from vines introduced from the east and characterized by large berries with solid flesh, some of them seedless. The mountain areas of Tajikistan contain relics of many vines produced from seedlings of the wild *Vitis vinifera* ssp. *sylvestris* which has small juicy berries of the wine type; wild forms of this type are still found in the area. All those found so far have either hermaphrodite or functionally female flowers and excavations have shown that these two types were cultivated in the Eneolithic and Bronze ages. In the Greco-Bactrian period, vines were introduced from Greece via the Black Sea area but very few of them remain in cultivation today. In the Islamic period forms with large berries and solid flesh and also seedless forms penetrated this area too; today all gradations between these and the primitive local types are to be found. These were mistaken by M. G. Popov for relics of an original wild vine, *V. spontanea*, supposed to have hermaphrodite flowers.

1975 Shetty, B. V.
Cytotaxonomical studies in Vitaceae.
Bibliogr. genet. 1959 : **18** : 167–272.

Morphological descriptions and somatic chromosome numbers are given for 18 species, together with illustrations of plant habit and diagrams of metaphase plates. Chromosome fragments were seen at meiosis in some species but were rare at mitosis. Three pairs of nucleolar chromosomes occur at mitosis in two *Vitis* species ($2n = 38$) and two *Ampelocissus* species ($2n = 40$), and two pairs in *Tetrastigma sulcatum* ($2n = 22$), four *Cissus* species ($2n = 24$) and *Cayratia tenuifolia* ($2n = 30$); at meiosis the corresponding numbers of bivalents occur but no multivalents are formed, suggesting that these species are ancient allopolyploids behaving as diploids. *Cissus setosa* ($2n = 22$) has large chromosomes indicating primitiveness; in spite of only having one pair of nucleolar chromosomes it is regarded as being of polyploid origin. This species also showed desynapsis and was quite distinct in caryotype from other members of the genus. In a green grape, *V. vinifera* 'Pachai Drakshi', secondary associations were observed at metaphases I and II, the maximum values being $1_{IV} + 2_{III} + 4_{II} + 1_{I}$. It is suggested that *V. vinifera* is a hypertetraploid with the basic number $x = 8$ and a haploid constitution which may be represented as AAAABBBCCCDDEEFFGGH ($n = 19$). The similarity in caryotype and morphological characters between *Vitis* and *Ampelocissus* is stressed.

Appendices give measurements of chromosomes, pollen grains and stomata in the material studied and a compilation of chromosome numbers in the family.

1976 Mihailova [Mihajlova], P. V.
Despre variabilitatea tipului florii la viţa de vie. (**On the variability of the type of flower in the vine**).
An. Romîno-Soviet.: Ser. Agric. 1957 : **11** : No. 2 : 91–99.

[Cf. XXVII, 3460].

1977 Nastev, D.
(**A contribution to fertilization studies of domestic and some foreign vine varieties commonly grown in the Macedonian People's Republic**).
God. Zborn. zemjodel.-šumarsk. Fak. Univ., Skopje (Ann. Rep. Fac. Agric. For. Univ. Skopje) 1958 : **11** : 111–42. [Macedonian].

Further details of the floral biology of varieties grown in Macedonia are given [cf. XXVI, 3781].

1978 Pogosjan, S. A.
(**Choosing parental sets for breeding varieties of vine for wine in south Armenia**).
Agrobiologija (Agrobiology) 1959 : No. 1 : 91–99. [Russian].

Breeding wine varieties at the Viticultural Institute in Erevan is reported. It was found that open-pollinated seedlings of many oriental cultivars and varieties from the Black Sea basin show great variability in juice colour and sugar and acid content, and provide valuable material for selection of varieties for making high-quality wine of various kinds. Crossing oriental with Black Sea varieties proved an even more effective breeding method. The best breeding material was provided by Sev Ajgeni, Kahet, Saperavi, Areni, Muscat Fioletovyj [Mauve Muscat], Furmint and Muskat Černyj [Black Muscat] for crossing between themselves or with other varieties. The results are many high-yielding hybrids with coloured juice, a high acid content and a high or moderate sugar content. Mention is made of open-pollinated seedlings of Kohpeni, Berkašat and Tavkveri which make fine red table wines.

1979 Kaz'min, G. T.
(**Viticulture in the Habarovsk Territory**).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1959 : No. 5 : p. 37. [Russian].

Alpha was the most productive among the varieties tested at Habarovsk and Taežny Izumrud [Tajga Emerald], Dal'nevostočnyj Ramminga [Far-Eastern Ramming], Suputinskij Belyj [White Suputinskij] and 229 were also early enough to ripen berries and form good bunches. The flavour of all these is good. In the winter of 1950–1 the above varieties survived a temperature of —47° C. after they had been covered up with earth, peat or sawdust.

1980 Pine, T. S.
Development of the grape dead-arm disease.
Phytopathology 1959 : **49** : 738–43.

Of twenty-one European grape varieties grown in California, none was resistant to *Phomopsis viticola*.

1981 Ghillini, C. A.
La malattia della vite detta "sfaldatura": studio dell'agente patogeno, analisi della resistenza delle Cv. e mezzi di lotta. **(The vine disease called exfoliation: study of the pathogenic agent, analysis of the resistance of cultivars and methods of control).**
Riv. Vitic. 1959 : **12** : 223–38, 259–76.

The etiology of the disease, which is caused by a fungus belonging to the *Fibrillaria* type of the Basidiomycetes, is described. Observations on 35 cultivars showed that the least susceptible are vines belonging to *Vitis riparia*; *V. europaea* 'Garganega' and certain direct producers such as Clinton and Baco [Worm] also showed some resistance. The most resistant rootstocks were Riparia gloire, Riparia tomentosa, Riparia tomentosa x Rupestris 3306, Riparia x Rupestris 101–14 and Berlandieri x Riparia 34 EM. Most other American vines were susceptible.

FOREST TREES

1982 Det norske Skogforsøksvesen 1958–59. **(The Norwegian Forest Research Department, 1958–59).**
Norsk Skogbruk 1959 : **5** : 555–58.

Provenance trials of spruces from different regions of Norway and from Germany are continuing. Trials of aberrant pines from Skjåk showed that the abnormalities were genetically controlled [cf. XXIX, 4521–2]. Natural and induced mutants of various species are under study.

1983 Johnsson, H.
Föreningen för växtförädling av skogsträd 1936–1958. **(The Association for Forest Tree Breeding, 1936–1958).**
Pp. 68.

In this survey of the organization and work of the Swedish Association for Forest Tree Breeding during the above period, the activities referred to include the identification of plus trees and plus stands, the use of grafting in the establishment of seed plantations, hybridization work in *Populus*, *Betula*, *Larix* and other genera, polyploidization in various genera and provenance and progeny trials. A list of papers published during the period is also provided.

1984 Johnsson, H.
Berättelse över föreningens för växtförädling av skogsträd verksamhet under år 1958. **(Report on the work of the Association for Forest Tree Breeding during the year 1958).**
Årsberätt. För. Växtf. Skogstr. 1958 : 3–20.

In controlled pollinations, transparent plastic tubes for isolation have proved better than opaque or coloured tubes or fabric or parchment bags; viscose cellulose bags were best.

Aspen. Hybrids from *Populus tremuloides* x *P. sieboldii* are being tested at Ekebo. At Sundmo, crosses of aspens from northern Sweden with high-altitude forms from the Erzgebirge have been effected.

Alder. Trials of *Alnus incana* x *A. glutinosa*, diploid and triploid families of *A. rubra* x *A. glutinosa* and diploid and triploid families of *A. glutinosa* are under way at Ekebo.

Ash. At Ekebo, material from controlled crosses is being compared with open-pollinated material.

Pine. Progenies from crosses between pines of different provenance are undergoing tests at the different stations.

Spruce. Trials of progenies from crosses between trees of different provenance are in progress.

Larch. At Ekebo, testing for self fertility is being carried out in European, Japanese and Siberian larches with a view to establishing clones with low self fertility for the production of hybrid seed. Interspecific crossing through open pollination was effected in *Larix decidua* by removing the male flower buds from trees growing in a mixed planting with *L. leptolepis*; a good yield of seed was obtained. Interspecific crosses have also been carried out at Sundmo.

Proceedings of the 6th Northeastern Forest Tree Improvement Conference, held at Beltsville, Maryland, August 21–22, 1958 (1959) : Pp. 45. (Mimeographed).

1985 *Mitchell, H. L. The possibilities of using forest survey to locate individual trees that are superior with respect to wood quality as well as form and growth rate. (pp. 8–18).*

The systematic mass sampling methods of the Mississippi Forest Survey have facilitated studies of wood density in five pine species: *Pinus elliottii, P. palustris, P. echinata, P. taeda* and *P. mitis.* A standard calibrated increment borer was used and samples were taken as far as the pith.

Wood density was clearly related to age and the five species fell into three groups, distinct over the entire age range. Evidence of geographical variation in wood density which appears to increase from north to south was found. This variation in wood density of *P. echinata* was evident over the entire age range while the comparable variation in *P. taeda* only became pronounced in trees of over twenty years.

1986 *McKay, J. W. Techniques in breeding new varieties of orchard trees. (pp. 21–25).*

A general survey is made of the methods used in breeding new varieties of fruit and nut trees.

1987 *Little, S. & Tepper, H. B. Six-year results from a Maryland planting of loblolly pines from different seed sources. (pp. 26–29).*

Seed sources were selected to test the hypothesis that geographic races of *Pinus taeda* are primarily associated with temperature. Although southern stocks grew more rapidly in the nursery, the local source appeared more satisfactory under northern field conditions.

1988 *Armstrong, M. M. A note on the tree improvement activities of the Armstrong Forest Company. (pp. 35–36).*

Fifteen plus trees have been recorded and marked since January 1957; it is hoped to use these in improving breeding stock. They are: *Prunus serotina* (10 trees), *Acer rubrum* (2), *Magnolia acuminata* (1), *Liriodendron tulipifera* (1) and *Fraxinus americana* (1).

A seed stand of *Picea abies* is being prepared for genetic work and for seed supply. Form and seed production were the main factors in selection and pollination will be limited to the selected trees.

1989 MERGEN, F.
Forest tree breeding research.
Unasylva 1959 : **13** : 129–37.

A survey of interspecific hybridization is presented which deals in turn with: examples of natural hybridization; some results of controlled hybridization in poplar, pine, spruce and chestnut; the use of seed orchards and some techniques of hand pollination for controlled crossing; and methods of flower induction.

Conférence sur la physiologie de la croissance. (**Conference on the physiology of growth**).
Bull. Soc. bot. Fr. 1959 : **106** : 259–89.

1990 *Guinier, P. Photopériodisme systématique et écologique chez les végétaux ligneux. (Systematic and ecological photoperiodism in woody plants).*

It is pointed out that species occurring in a wide range of latitudes often have physiological races differing in photoperiodic reaction. Mention is made of such races of *Pinus sylvestris* and *Picea excelsa* and it is thought that other tree species may also show variation in photoperiodic requirement.

1991 SUHANOVA, I. V.
(**Some characteristics of early and late forms of *Quercus robur***).
Les. Hoz. (Forestry) 1959 : No. 1 : 68–69. [Russian].

Observations on trees of both types in the province of Rostov have shown that the late form is superior to the other in resistance to low temperatures and insects. It yields more timber, and has straighter, taller and thicker trunks.

1992 IVANNIKOV, S. P. & ROSTOVCEV, S. A.
(**Introduction of poplar varieties in forestry**).
Les. Hoz. (Forestry) 1959 : No. 7 : 70–71. [Russian].

Mention is made of new poplar forms obtained by hybridization in the USSR in recent years. Many are characterized by quick growth, great winter hardiness, good timber and resistance to *Ganoderma.* Most have been given varietal names and have been propagated vegetatively for trials on forest farms in 15 provinces of European Russia.

1993 ROVSKIJ, V. M.
(**Improving the forest-tree composition of the Central Asiatic tugajs**).
Les. Hoz. (Forestry) 1958 : No. 5 : 71–72. [Russian].

It is proposed to improve the desert association known as *tugaj* by supplanting *Populus diversifolia* and other trees having little economic value by quick-growing poplar hybrids. In this connexion mention is made of hybrids of *P. alba* x *P. diversifolia* and of an unidentified poplar species from Taškent x *P. diversifolia* which were bred at the Central Asiatic Branch of the Forestry Institute. The unidentified species is interesting for the ease with which it propagates vegetatively. The hybrids are being selected for quick growth, timber quality, capacity for vegetative reproduction and drought resistance.

1994 Beskaravajnaja, M. A.
(Training the hybrids of *Acer negundo* for drought resistance).
Les. Hoz. (Forestry) 1959 : No. 8 : 79–80. [Russian].

The drought resistance of *A. negundo* x *A. platanoides* hybrids in the second and third generations was improved by growing the first generation hybrids on different soils under rainfed conditions at Kamyšin. A number of hybrids which combined quick growth and winter hardiness with drought resistance have been selected in the second and third generations. Some of the hybrids were resistant to soil salinity in the second generation but not in the third.

1995 Longman, K. A. & Wareing, P. F.
Early induction of flowering in birch seedlings.
Nature, Lond. 1959 : **184** : 2037–38.

Flowering was initiated at a very early age in seedlings of *Betula verrucosa* raised under conditions of continuous growth under long days or continuous illumination in a greenhouse at about 15°–25° C. A grafting test proved that a permanent maturation of the tissue had been brought about.

1996 Šeršukova, P. O.
(The chromosome number of *Ulmus pinnato-ramosa* Dieck. et Koehne).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **127** : 210–12. [Russian].

As a preliminary to systematic and polyploidy studies of the above species at a Kazah forest station of the Forest Institute of the Academy of Sciences, chromosome counts were made; it had $2n = 28$ chromosomes.

1997 Moravskaja, A. S.
(Two forms of *Ulmus laevis* and of *U. carpinifolia*).
Les. Hoz. (Forestry) 1958 : No. 7 : p. 79. [Russian].

Forms different in respect of time of flushing were found in the province of Voronež. In the case of *U. laevis*, the early flushing form also flowered earlier and developed and ripened its fruits earlier.

1998 ***Leucaena glauca.***
Rur. Res. CSIRO 1959 : No. 29 : 12–14.

An interim report is given on breeding studies undertaken to utilize this leguminous tree as a grazing crop in Australia.

1999 Ragonese, A. E. & Rial Alberti, F.
Un nuevo sauce híbrido de valor ornamental obtenido en la República Argentina. **(A new hybrid willow of ornamental value obtained in the Argentine Republic).**
FAO, UN, Rome 1959 : No. FAO/59/9/6989 : Pp. 2. (Mimeographed).

A botanical description is given of *Salix matsudana* 'Rojo-flexuoso' [Red Flexuose], thought to be derived from *S. matsudana* f. *tortuosa* ♀ x *S. alba* var. *tristis* ♂. In a back cross of the hybrid as pollen parent with the first putative parent, 44% of the F_1 had the flexuous character and 56% straight branches.

2000 Petrini, S.
De två äldsta svenska tallproveniensförsöken. **(The two oldest Swedish pine-provenance trials).**
Medd. SkogsforsknInst. Stockh. 1958–59 : **48** : No. 11 : 1–49.

The results of two series of trials, established in 1904 at Ollestad (57° 58′ N.) and Torared (56° 41′ N.) in Sweden and studied in 1957, are presented. The material tested came from latitudes 56°–63° 50′ N. in Sweden and 49° and 52° 50′ N. in Germany. The highest proportion of straight-stemmed trees occurred in a type of more northerly provenance, while the most crooked trees were those from Germany. Fine branching was also most frequent in northern trees. The stands at Torared were much thinner than those at Ollestad and tree dimensions were also smaller at the former. At both stations the material of northern provenance was inferior in both height and diameter; southern Swedish trees gave the best total production.

2001 Ehrenberg, C. E.
Über Entwicklungsanomalien in Kreuzungsnachkommenschaften bei *Pinus silvestris* L. **(On developmental abnormalities in hybrid progenies of *P. silvestris* L.).**
Medd. SkogsforsknInst. Stockh. 1958–59 : **48** : No. 2 : 1–14.

Data on progenies from crosses involving two plus and two minus trees from southern Sweden, two plus and two minus trees from northern Sweden and one plus tree from central Sweden are presented. Results for the crosses between southern Swedish trees have already been reported [XXVIII, 2290]. The progenies of plus x plus combinations were superior to combinations involving one or two minus trees, and the open-pollinated progenies of plus trees were better than those of minus trees. Among the minus trees, VIII:46 from southern Sweden, whether used as male or female parent, gave a higher percentage of malformed seedlings than any other tree. Prolepsis was frequent in the progenies of plus trees, though less so than in those of VIII:46, while forking was absent in plus x plus progenies but present in all minus combinations. In selfed progenies, the percentages of abnormal plants were low, possibly because of their decreased vitality.

2002 Panin, V. A.
(The characteristics of spruce forms which differ in shape of cones).
Les. Hoz. (Forestry) 1959 : No. 7 : 74–75. [Russian].

A study of spruce types in a large forest in the Vologda province showed that they were intermediate between *Picea abies* and *P. obovata* in the shape of cone scales and other characteristics. However, the absence of the above two species in the typical form and the occurrence of each variant in a definite habitat disproves the previously held view of the hybrid origin of the latter and suggests that they are different ecotypes of *P. abies.* It was found that the ecotypes with the more acute cone scales are more productive of timber on well drained soils than the ecotypes with the less acute scales, but the latter were more adapted to waterlogged soils.

2003 Aytug, B.
Abies Equi Trojani Aschers. et Sinten est une espèce d'origine hybride d'après l'étude des pollens. **(*A. Equi-Trojani* Aschers. et Sinten is a species of hybrid origin according to a study of the pollen).**
Pollen et Spores 1959 : **1** : 273–78.

A detailed morphological study of the pollen from trees in the Evciler district of Turkey indicated that this species is a hybrid; the parent species are probably *A. bornmuelleriana* and *A. cephalonica.*

2004 Nilsson, B.
Om lärkfrö och lärkhybrider för mellansverige. **(On larch seed and larch hybrids for central Sweden).**
Årsberätt. För. Växtf. Skogstr. 1958 : 43–58.

This paper has already been summarized from another source [cf. 834].

2005 Lagov, I. A.
(The seed quality of biological forms of the Siberian larch).
Les. Hoz. (Forestry) 1959 : No. 2 : p. 72.

Three biotypes of *Larix sibirica* differing in the colour of the immature cones were found in Kazahstan. The most valuable biotype had cones of a mauve-red colour, another biotype had yellow-green cones, and the third, thought to be a hybrid, green cones with narrow mauve edges. The first biotype had larger cones and a higher 1000 seed weight. The seed viability and germination rate of this biotype were also higher than that of the biotype with green cones. The third biotype showed a great variability in all these respects. The first biotype ripens and sheds its seed 4–5 days earlier than the other two.

VEGETABLES

2006 Aleksandrov, S. V.
Obţinerea seminţelor hibride de castraveţi şi tomato în sere. **(Obtaining hybrid seed of cucumbers and tomatoes in greenhouses).**
An. Romîno-Soviet.: Ser. Agric.-Zooteh. 1958 : **12** : No. 3 : 59–72.

[Cf. XXVIII, 4779].

2007 Kihara, H.
Breeding of seedless fruits.
Seiken Jiho/Rep. Kihara Inst. Biol. Res. 1958 : No. 9 : 1–7.

The results obtained in Japan with *Citrullus vulgaris* have attained commercial significance. When pollinated by 2*x* plants, sterile triploids from 4*x* ♀ x 2*x* ♂ crosses have produced "seedless" parthenocarpic fruits containing white, undeveloped edible seeds. None of the various methods tested has proved wholly satisfactory as a means of eliminating or lessening the main defect of coloured empty seeds in the first fruits. Since viable seed is only secured from 4*x* ♀ x 2*x* ♂, production of 3*x* seed is expensive. By using a suitable 2*x* strain of *C. colocynthis* as ♀, it might be possible to overcome the drawback of obtaining seeds from only one direction of the crosses. An attempt is being made to breed a 2*x* water melon carrying genes for the production of viable seeds from 2*x* ♀ x 4*x* ♂.

Triploids of Japanese varieties of *Cucumis melo* have contained numerous hard seeds. When crossed with 4*x* Japanese melons (♀), an Indian variety has however proved promising in producing triploid hybrids which, when hand or open-pollinated, bear fruits with soft, semi-transparent seeds.

A "stoneless" pomegranate from Afghanistan is also described. The outer integument of the ovule is not lignified and the number of seeds per fruit is reduced; the embryos are below normal size. This type, which is highly pollen sterile, may have arisen as a bud sport.

2008 AIZENSTAT, I. S. [AJZENŠTAT, JA. S.] & ŞIPILOVA [ŠIPILOVA], I. I.
Particularităţile germinării polenului florilor de diferite vîrste la tomate şi mazăre. (**Details of the germination of the pollen of flowers of different ages in tomato and pea**).
An. Romîno-Soviet.: Ser. Agric.-Zooteh. 1957 : **11** : No. 5 : 40–44.

[Cf. XXVIII, 92].

2009 **Some thoughts on the adaptation of the varieties to the present requirements of horticulture.**
Zaadbelangen 1959 : **13** : p. 333. Also in Dutch, p. 328; French, 329–30 and German, 332–33.

The little attention so far paid to breeding for quality in vegetable crops is stressed and attributed to the lack of contact between breeder and consumer. The desirability of further research on quality is pointed out.

2010 BÖHME, H.
Über die Ursachen der unterschiedlichen Resistenz von zwei verschiedenen Knollenselleriesorten gegenüber der Blattfleckenkrankheit (*Septoria apii-graveolentis* Dorogin). [**The causes of the different resistance of two different celeriac varieties to leaf spot (*S. apii-graveolentis* Dorogin)**].
Phytopath. Z. 1959 : **37** : 195–213.

The development of *S. apii-graveolentis* on the susceptible variety Invictus and the resistant variety Wiener Markt [Vienna Market] growing in the open is described. The intensity of fruiting of the fungus varied with the susceptibility of the host and can be used for quantitative determinations of susceptibility. In Wiener Markt, the fruiting time was slightly longer, and fewer and smaller pycnidia were produced than in Invictus. Also the development of the mycelium in the leaves was inhibited on Wiener Markt although spore germination occurred at similar speed and with similar frequency in both varieties. Cultures of the fungus from both varieties when grown on leaf and tuber extracts from the two varieties showed no differences in pycnidial formation corresponding to those observed under natural conditions. Samples of the fungus from different localities varied in their aggressiveness, two Italian strains being capable of severely infecting Wiener Markt which is relatively resistant to Quedlinburg strains.

2011 WEINMAN, A. A. & GABELMAN, W. H.
Variations in cytoplasmic sterility of carrot as measured by tetrad segregation in partially fertile plants.
Genetics 1959 : **44** : p. 544. (Abst.).

A partially fertile plant shed pollen in tetrads. Its progeny from selfing segregated into plants shedding this type and others producing ordinary pollen. As shown by the acetocarmine test, tetrads with all five possible combinations of viable and nonviable grains occurred. The frequencies of the five classes of tetrads were related to degree of fertility.

2012 SCOTT, H. E.
Varietal responses of carrots to carrot rust fly, *Psila rosae* (F.) (Diptera: Psilidae).
J. Elisha Mitchell sci. Soc. 1959 : **75** : 151–53.

A test during 1948–52 in a locality near Toronto, Ont., showed varieties of the Nantes type to be the most susceptible, Danver's Half Long and Red Core Chantenay intermediate in reaction and Imperator the least susceptible.

2013 HANAOKA, T. & ITO, K.
(On the comparison of strains of the Sapporoki onion).
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1959 : No. 74 : 113–18. [Japanese].

Data are provided on the maturation period, bolting period, yield, bulb shape and disease resistance of strains obtained by mass selection of *Allium cepa* 'Sapporoki' [Sapporo Yellow].

2014 VOVK, A. M.
(The mosaic virus of onion and control measures against it).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1959 : No. 2 : 27–31. [Russian].

Allium fistulosum, employed as a pollen parent, transmitted resistance to mosaic to its progeny in crosses with *A. cepa* 'Romanovskij', 'Danilovskij' and 'Msterskij' at the Genetics Institute of the USSR Academy of Sciences.

2015 Ghisleni, P. L.
Aggiornamenti su problemi biologici e genetici dell'asparago (*Asparagus officinalis* L.). [**Bringing biological and genetical problems concerning asparagus (*A. officinalis* L.) up to date**].
Allionia, Torino 1958 : **4** : 37–50.

A review is given of genetical work on this crop with special emphasis on sex determination and the relation between sex and yield.

2016 Huyskes, J. A.
The value of comparative tests of progenies from open-pollinated female asparagus plants.
Euphytica, Wageningen 1959 : **8** : 141–44.

In an isolated seed garden with only one male plant, good seed sets were obtained only on female plants within a radius of 1·5 m. from the male plant. Outside this area, pollination, which was effected by bees and other insects, was low. Since the female plants in a trial field can thus be pollinated by only a limited number of males and since the variation in spear production is approximately equal in the male and female plants, differences in the progenies will be due to both parents. It is concluded that the assessment of the genetical value of open-pollinated mother plants on the basis of progeny tests is unreliable.

2017 Die Züchtung landwirtschaftlich genutzter Cruciferen. (Bericht über ein Symposion in Gross-Lüsewitz). [**The breeding of crucifers used in agriculture. (A report on a symposium in Gross-Lüsewitz)**].
Dtsch. Landw., Berl. 1959 : **10** : 519, 553–55.

In his opening speech Schick pointed out the future importance of *Brassica* fodder plants and mentioned ways of improving these crops for mechanized farming. Rundfeldt spoke on Heterosis-Züchtung bei *Brassica* Arten [Heterosis breeding in *Brassica* species], mentioning that hybrid varieties are particularly productive. From his own experience in cabbage breeding, Rundfeldt recommended four inexpensive processes for the production of hybrid seed. The simplest method for self-sterile species is the production of synthetics after testing for combining ability; it is advantageous to use material which may be vegetatively propagated. A second method for self-sterile species involves growing two lines together as a mixed crop; the lines have recessive marker genes so that selfed progeny may be distinguished from hybrids. The third method involves the use of pollen-sterile lines, and the fourth, using self-sterile lines, is thought to be the most promising of all. By bud pollination it is possible to self normally self-sterile lines and so obtain strains homozygous for self-sterility alleles and with these strains the double-cross method may be used.

Einige Erfahrungen bei der Züchtung von Cruciferen in Svalöf [Some experiences in the breeding of Cruciferae in Svalöf] was the subject of Olsson's paper. Pollination studies have been carried out; in general rape and swede are self fertile and turnip and mustard self sterile but some self-sterile rape plants are also found. The oil content of progeny shows a clear relation to that of the mother plant; seed weight does not show such a relationship. Rape synthesized from crosses between turnip and cabbage now equals natural rape in fertility after being selected for several years. Synthetic rapes have been found superior to natural rapes in several characters, including winter hardiness, quality and resistance to *Peronospora*.

Martínek spoke on Der gegenwärtige Stand der Cruciferenzüchtung in der ČSR unter Berücksichtigung neuer Züchtungsmethoden [The present position of crucifer breeding in the Czechoslovak Republic with reference to new breeding methods] and mentioned that winter rape is the most important oil crop in Czechoslovakia; breeding for frost resistance is under way. Also cabbages are being improved, attention being given to the production of hybrid seed.

In his paper, Über einige Ergebnisse von Bastardierungsversuchen zwischen jarowisiertem Winterraps, Sommerraps und Sommerrübsen einerseits und *Brassica chinensis* L., *Brassica oleracea* var. *acephala* D.C. anderseits und ihre Bedeutung für die praktische Züchtung [Some results of hybridization experiments between vernalized winter rape, spring rape and spring turnips, on the one hand, and *B. chinensis* L. and *B. oleracea* var. *acephala* DC., on the other, and their importance for practical breeding], Moldenhawer mentioned that these crosses yielded only a few fertile seeds. Progenies from a cross of a vernalized winter form showed considerably more variability and sterility than crosses between spring forms. The F_2 from the cross of vernalized Lembkes Winterraps [Lembkes' winter rape] x fodder cabbage had a vegetative period of 98 days whereas the parents have vegetative periods of 126 and 172 days respectively. Some F_3 progenies of different crosses appear promising; the aim is to produce an early-ripening spring variety with a high yield of seed and oil and resistance to shattering. Troll provided Beiträge zur Bedeutung der ökologischen Streubreite physiologischer und morphologischer Merkmale bei Zucht- und Landsorten von Winterraps und Winterrübsen sowie deren Bastarden [Contributions on the importance of the ecological range of physiological and morphological characters in bred and land varieties of winter rape and winter turnips and also of their hybrids]. Continental forms complete their vegetative development from germination to flowering nine days earlier than the maritime variety Lembkes Winterraps. The continental types are also distinguished by their greater branching at a low level. The hairiness of the first foliage leaves of different rapes and of hybrids between them was investigated; this character can be used in the early diagnosis of species similarity in rape x turnip hybrids. Forms poor in mustard oil did not show a reduced seed yield.

Untersuchungen über die Winterfestigkeit und Frostresistenz des Rapses [Investigations on the winter hardiness and frost resistance of rape] was the subject of Litynski's paper. It was found that increased winter hardiness is associated with a high dry-matter content and osmotic pressure in the root neck, greater length of the root neck, high imbibition capacity of the seed, a low tendency towards bolting after spring sowing and a high protein content in the seed. Results obtained in the laboratory need to be confirmed in field experiments.

Hoppe reported on Probleme der Senfzüchtung unter Berücksichtigung populationsgenetischer Gesichtspunkte und der Befruchtungsregulierung [Problems of mustard breeding with reference to the viewpoints of population genetics and the regulation of fertilization]. The most important yield components for mustard are the number of seeds in a pod, the number of pods per plant and the 1000-seed weight. A new selection procedure developed at Gross-Lüsewitz has raised the number of seeds per pod from 4 or 5 to 7–9 and in exceptional cases to 16. This method involves counting the number of seed primordia in the bud and rejecting all plants with an unsatisfactory number before flowering [cf. XXVIII, 3480].

Schwanitz spoke on Intra- und interspezifische Kreuzungen bei *Brassica* [Intraspecific and interspecific crosses in *Brassica*]. Crosses were made between kale and white cabbage and between kale and Savoy cabbage. It was found impossible to combine tenderness of the leaf with crinkling; large cell size determines tenderness and weak crinkling, small cell size being associated with a high fibre content and greater crinkling. A cross of Brussels sprouts x red cabbage did not yield any forms with red sprouts. Correlations between a low proportion of stalk in the sprouts and a strong bitter taste and between a high proportion of stalk and a sweet taste were found. Rape x cabbage crosses gave some completely fertile progeny with $2n = 38$ and containing part of the *B. oleracea* genome. Polyploids of *Brassica* and *Sinapis* showed a decrease in productivity.

Kolev reported in his paper on Die Züchtungsarbeiten bei den Cruciferen in Bulgarien [Breeding work with Cruciferae in Bulgaria] that breeding of kale has begun. It is hoped that *B. oleracea* var. *chinensis* and var. *pekinensis* with their rapid development and high biological value will give good results. Much attention is also being given to the improvement of heading cabbage for culinary use.

Synthetische Markstammkohl-Züchtung auf Qualität und die Eignung für verschiedene Nutzungszwecke [Breeding synthetic marrow-stem kale for quality and suitability for different purposes] was Dobschütz's subject. The results of diallel crosses involving marrow-stem kale, brown cabbage, kale, cauliflower, kohl rabi, Savoy cabbage and Brussels sprouts were reported. The F_1 from crosses involving marrow-stem kale were particularly high yielding, Savoy cabbage crosses produced much leaf and had a high protein yield and brown cabbage and kale crosses were winter hardy, the brown cabbage crosses showing greater height and the kale crosses being outstanding for their protein and carotene contents. Kohl rabi and cauliflower crosses were of no positive value. Many different forms occurred in the F_1 progenies and it is thought probable that the following types will be developed: tall, productive marrow-stem kales suitable for main crops; medium-tall, winter-hardy types rich in carotene and protein for green fodder in the winter, and short types for grazing in March and April after sowing in July and August.

Thompson, in his contribution on Züchtungsprobleme bei Markstammkohl [Breeding problems with marrow-stem kale], reported that the importance of this plant for autumn and winter fodder is increasing in England and it is necessary to select a low-growing type for winter pastures. Already some short, thick-stemmed selections with low fibre content have been found to suffer fewer winter losses than commercial types. The double-cross method has been used to produce uniform hybrids with maximum heterosis. Du Crehu, in speaking on

Die Züchtung von Kohl [Kale breeding], mentioned the difficulty of combining all the desired characters in one fodder variety. Tjallingii dealt with Physiologische Spezialisierung bei *Plasmodiophora brassica* und die Züchtung hernieresistenter Wasserrübensorten [Physiological specialization in *P. brassica* and the breeding of turnip varieties resistant to club root], mentioning that eight physiological races of *P. brassicae* are known in Holland and Belgium and it is probable that other races occur in Norway. Resistance to some races has been found in land varieties and these have been used in breeding; the race from St. Maartens-Leerne in Belgium has attacked all the turnip varieties tested. Neitzel contributed Über Viruskrankheiten an landwirtschaftlich genutzten Cruciferen, insbesondere an Kohlrüben [On virus disease in crucifers used in agriculture, especially in swedes]. Mention was made of the difficulties of classifying the viruses and their numerous variants. Crinkle mosaic is probably caused by several virus complexes belonging to the turnip virus 1 group. The most resistant German varieties are Hohenheim and Vogesa. A test is used in which the resistance of new breeding lines can be determined in young seedlings 10–14 days after infection brought about by the vector *Myzus persicae.*

2018 Nieuwhof, M.
Problems in the design of variety trials with spring cabbage.
Euphytica, Wageningen 1959 : **8** : 151–56.

The relative yields of three strains differing in width of spread remained fairly constant at four different spacings, the strain with a small spread showing less retardation of growth at the closest spacing. A spacing of 50 x 50 cm. is regarded as giving reliable results. When the results from a block trial of 21 strains in two replications with 33 plants per plot were compared with those from a Latin square with the same strains but only one plant per plot, the standard deviation and coefficient of variation per plant were smaller for the second than for the first layout. It is suggested that for simple yield trials, the Latin square, which takes less space than the block trial, should be used.

2019 Nieuwhof, M.
Some experiences with the breeding of pointed-headed cabbage.
Euphytica, Wageningen 1959 : **8** : 163–68.

The substance of this article has been summarized from another source [cf. XXIX, 2011].

2020 Jensma, J. R.
Rassenproeven met savooiekool. **(Varietal trials of Savoy cabbage).**
Meded. Inst. Vered. TuinbGewass. 1959 : No. 146 : Pp. 34.

Data are given on the performance of 100 selections of early, autumn, winter and storage varieties, tested in 1954 and 1955 at various stations in the Netherlands. Forty varieties were recommended and admitted to the official variety list.

2021 Bucur, E.
Putregaiul bacterian al verzei. (**Bacterial rot of the cabbage).**
Anal. Inst. Cerc. agron. Romîn. 1957 (1958) : **25** : No. **6** : 551–74.

None of the varieties studied in this investigation was immune to *Xanthomonas campestris*; the most resistant were Licurișcă and Varză de Buzău [Buzău cabbage].

2022 Helm, J.
Über den Typus einiger von Linné aufgestellter, nicht kopfbildender Sippen von *Brassica oleracea* L. (**On the type of some nonheading varieties of *B. oleracea* L. established by Linnaeus).**
Feddes Repert. 1959 : **62** : 44–59.

The author elucidates the identity of the three Linnaean kale varieties *viridis*, *selenisia* and *sabellica*.

2023 Holland, N. S. & Lana, E. P.
Mantador broccoli.
Bi-m. Bull. N. Dak. agric. Exp. Sta. 1959 : **21** : No. 2 : p. 17.

The Mantador broccoli is a selfed selection from the variety DeCicco. It matures early, producing a heavy crop of side shoots. It is recommended as a spring crop.

2024 Grant, W. F.
Cytogenetic studies in *Amaranthus*. II. Natural interspecific hybridization between *Amaranthus dubius* and *A. spinosus*.
Canad. J. Bot. 1959 : **37** : 1063–70.

Hybrids ($2n = 49$) between *A. spinosus* ($2n = 34$) and *A. dubius* ($2n = 64$) were discovered at Macdonald College, Quebec. Meiosis was irregular, 15_{I} being most frequently observed at metaphase I, together with 17_{II} presumed to be allosyndetic. Exclusion of univalents from the nuclei at telophase I and II resulted in supernumerary microspores and reduction in mean size of the microspores. The hybrids were consequently highly sterile. The few undersized seeds produced failed to germinate.

Seed weight, seed volume, stoma size and pollen-grain size were proportional to chromosome number in the parents but not the hybrids. Since *A. dubius* exhibits regular bivalent behaviour, it is considered to be an allopolyploid of which *A. spinosus* has been one progenitor. *A. quitensis* ($2n = 32$) may have been the other progenitor, although possibly more than two species were involved in the origin of *A. dubius*. In view of the high sterility of the hybrids, gene exchange between *A. spinosus* and *A. dubius* must be very limited.

2025 Janick, J. & Ellis, J. R.
Identification of the sex chromosome in *Spinacia oleracea*.
Genetics 1959 : **44** : p. 518. (Abst.).

The six primary trisomics of spinach ($n = 6$) obtained from triploid pistillate (XXX) x diploid staminate (XY) crosses were respectively designated reflex, oxtongue, star, curled, wild and savoy in accordance with distinctive vegetative characteristics. The results of crosses of staminate plants of the six phenotypes with pistillate diploids indicated that reflex was trisomic for the sex-determining chromosome, having the genotype XXY. Each morphological type was associated with one of the six chromosomes. The sex chromosome was the longest and was characterized by a submedian centromere. No obvious heteromorphism in the pair of sex chromosomes was observed in somatic cells. The existence of races differing in the morphology of this pair of chromosomes was confirmed.

2026 Janick, J., Mahoney, D. L. & Pfahler, P. L.
The trisomics of *Spinacia oleracea*.
J. Hered. 1959 : **50** : 47–50.

The six primary trisomics are described morphologically [cf. 2025]. The results from trisomic ♀ x diploid ♂ crosses and the reciprocals indicated that the extra chromosome of each of the four trisomics tested was transmitted only when the trisomics were the ♀ parents. As already reported, the gene for sex determination was situated on the extra chromosome associated with the reflex type.

2027 Tabushi, J.
(Trisomic spinach plants).
Seiken Jiho/Rep. Kihara Inst. Biol. Res. 1958 : No. 9 : 49–57. [Japanese].

Four out of the possible six trisomics have been obtained by crossing triploid and diploid strains. The extra chromosomes of the trisomics are the C, D, E and F chromosomes; no trisomic with the large A or B chromosomes was obtained. The morphological characters by means of which the trisomics can be distinguished are described. Ovule transmission of the extra chromosome was 20–40% in contrast to 0–10% through the pollen. The sex ratio in all the trisomics was 1 : 1 except in the C trisomics which were all female. The modal chromosome configuration of the C and D trisomics was $\mathrm{I}_{\mathrm{III}} + 5_{\mathrm{II}}$; of the E and F trisomics $6_{\mathrm{II}} + 1_{\mathrm{I}}$. Pollen fertility was good in all the trisomics.

2028 Kagawa, A.
(Studies on floral induction in slow-bolting spinach. IV. On intervarietal differences in response to low temperature).
Engei Gakkai Zasshi/J. hort. Ass. Japan 1958 : **27** : 234–40. [Japanese].

Thirteen varieties differing in period to bolting were studied. Low-temperature (2 ± 1° C.) treatment accelerated bolting in all cases, but the relative order in which the varieties bolted was little affected.

2029 Porcelli, S.
Miglioramento genetico della lattuga (*Lactuca scariola* L. var. *sativa* L. cv. "Trocadero"). [**Genetic improvement of lettuce (*L. scariola* L. var. *sativa* L. cv. Trocadero)**].
Ann. Sper. agr. 1959 : **13** : 789–822.

Figures presented show that the Italian lettuce meets less competition in the European markets in the period January to March. Attempts are therefore being made to breed forms suitable for this period, with more uniform quality and less tendency towards bolting. An account is given of the systematic position of the species, its origin, geographical distribution, floral biology and methods of breeding. Lettuce has been shown to be almost entirely self pollinated. Most of the cultivars introduced from elsewhere either proved inferior in leaf quality or had an excessive tendency to bolt when grown at Bari in southern Italy; even the best, White Boston and Improved Trocadero, showed variation in a number of morphological characters. Late maturity was correlated with large head, cold resistance and freedom from bolting. Selections were made from populations of the cultivar Trocadero, in which the chromosome number $2n = 18$ was confirmed. Clear differences between early and late-maturing selections were observed when the apical bud was examined in longitudinal section, floral primordia being visible in the former sooner than in the latter. The growth of the seedlings in the first three weeks was more rapid in the early selections, in which the first leaves grew more erect than in late types; the number of leaves formed in a given time was however greater in the late selections, both in the seedling and mature-plant stages; no bolting occurred in the late selections, which formed large compact heads with a mean weight of 373 g., with tender, broad leaves not more than 250 μ in thickness. The plants free from anthocyanin pigmentation were selected and these were found to have a pH of 5·8 compared with those with pigmented leaves in which the pH was 5·2; the unpigmented leaves had a lower sugar content than the pigmented. The content of reducing sugars during periods of low temperature was greater in the late selection than in early forms. No correlation was found between the pigmentation of leaves and seeds. The dry-matter content of the late type was 5% compared with 3·9% in the early.

The best late selection matures in 150–160 days and has been named Trocadero 2.

2030 SCHNATHORST, W. C.
Resistance in lettuce to powdery mildew related to osmotic value.
Phytopathology 1959 : **49** : 562–71.

Resistance in lettuce varieties was affected by environmental factors and could not be attributed to the thickness of the cuticle and upper epidermal wall. Physiological studies indicated that the osmotic values of field-resistant plants and resistant leaves of field-susceptible plants were great enough to inhibit water uptake and growth in the fungus. Differences in the osmotic value of the cell sap would also account for the changes in resistance caused by environmental factors affecting the concentration of sugars in the leaves, such as temperature, light intensity and mineral nutrition.

2031 SHIMOTSUMA, M.
Cytogenetical studies in the genus *Citrullus*, I. F_1 hybrids in the reciprocal crosses, *C. colocynthis* Schrad. x *C. vulgaris* Schrad.
Seiken Jiho/Rep. Kihara Inst. Biol. Res. 1958 : No. 9 : 17–22.

The above cross was successful in both directions. The F_1 plants showed hybrid vigour and were normal meiotically, forming 11_{II}. In fruit size they were intermediate between the parents. In colour and striping of the exocarp, colour and taste of the flesh, rind thickness and disease resistance, *C. colocynthis* was dominant over *C. vulgaris*, whereas in date of ripening and seed colour the latter was dominant.

2032 MEDINA, D. M., PRADO, O. T., MENDES, A. J. T. & ROESSING, C.
A poliploidia artificial na obtenção de melancia sem sementes. (**Artificial polyploidy in the production of seedless water melon**).
Bragantia 1958 : **17** : 81–100.

Colchicine-induced tetraploids of the American variety Keckley Sweet were stunted in growth compared with the diploids, had larger leaves and flowers and when selfed produced smaller fruits, which were round and contained few seeds. Microsporogenesis showed some irregularities of meiosis. When pollinated by diploids the tetraploids yielded triploids which were completely male sterile but set fruit on being pollinated with diploid pollen. Some of the triploid fruits were free from seed, others contained few or many empty but inedible seeds and some full seeds. Seeds from tetraploids and triploids germinated well at 30° C. but not when sown outside. The difficulties of producing commercial seedless water melon are discussed.

2033 HOLODEV, D. G.
(**High yield in individual water-melon plants**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 7 : p. 73. [Russian].

A water-melon hybrid found at the Bykovo Research Station bore 10 large and 2 smaller fruits with a dry matter content of 11%. Its flesh had a fine flavour. The seed has been gathered for further observations.

2034 WIECHERS, J. W.
Komkommerrassenproef 1959 op de proeftuin te Sappemeer. (**Cucumber variety trial, 1959, in the Sappemeer trial field**).
Tuinbouwber., Groningen 1959 : **14** : p. 211.

Among twelve varieties tested for earliness, yield, freedom from bitterness and incidence of blotch, Green Stick bittervrij [Green Stick Bitter-free] and Bitspot are recommended for further trial.

2035 **New cucumber for pickle growers expected soon.**
SC agric. Res. 1959 : **6** : No. 2 : p. 8.

Preliminary notice is given of new cucumber selections bred from an introduced Indian variety (PI197087) and a local selection. Resistance to anthracnose, downy mildew and powdery mildew is reported. Seed increase of some selections has already begun.

2036 AALDERS, L. E.
"Yellow cotyledon", a new cucumber mutation.
Canad. J. Genet. Cyt. 1959 : **1** : No. 1 : 10–12.

The mutant seedlings remained yellow until the cotyledons were nearly fully expanded; the true leaves were indistinguishable from those of normal plants. The character of yellow cotyledons is dependent on a single recessive factor (*yc*) which should prove useful as a marker.

2037 TULUPOV, JU.
(The cucumber variety Altajskij Rannij 166).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 7 : 21–22. [Russian].

Altajskij Rannij 166 [Altaj Early 166] was selected from a spontaneous hybrid between Murom 36 and Nerosimyj [Rainfed] at the West Siberian Horticultural Research Station and its productiveness and earliness were improved by training on a pumpkin stock. It outyields Murom 36 and has a higher proportion of top-grade fruits. The fruit is larger, has a higher sugar content and keeps better. It is tolerant of low temperatures.

2038 BARHAM, W. S. & WINSTEAD, N. N.
Ashe and Fletcher, two downy mildew and scab resistant cucumbers.
Bull. NC agric. Exp. Sta. 1959 : No. 409 : Pp. 8.

Detailed information on the performance and origin of Fletcher and Ashe is provided [cf. XXIX, 825]. The varieties were respectively developed by repeatedly back crossing (Highmoor x Palmetto) x Stono to Stono and [(Highmoor x Palmetto) x SC14] x Ashley to Ashley.

2039 RICK, C. M.
Non-random gene distribution among tomato chromosomes.
Proc. nat. Acad. Sci. USA 1959 : **45** : 1515–19.

Of the 18 spontaneous seedling mutations analysed, six (*Cu*, d_1^x, *dv*, *ff*, *Me*, Wo^m) were situated on chromosome 2, two (*rv*, *sf*) on 5 and two (*tf*, *Fw*) on 7. Chromosomes 6, 8, 9 and 10 each contained one of the mutations, respectively *yv*, *dl*, *ah* and *ag*. Mutations *gh* belonged to linkage group V (chromosome 11 or 12) and the remaining three (*ht*, *La*, w_4) showed no linkage. According to a binomial test, the occurrence of as many as six of the genes on chromosome 2 was nonrandom. Reasons are given for concluding that probably the concentration of genes on 2 did not result from the use of favourably situated markers or from the presence of duplicated segments but reflected the greater length and higher genetic activity of this chromosome.

2040 Forsøg med sorter af tomater i væksthus 1957–58. **(Trials of tomato varieties in the greenhouse, 1957–58).**
Tidsskr. Planteavl 1959 : **63** : 539–42.

In tests of nine varieties, seven of which were F_1 hybrids, Revermun, Ware Cross and Danimuna gave the highest total yields and also the highest yields of top-quality tomatoes.

2041 SHILLING, P. R.
An investigation of the hereditary character, woolly, in the tomato.
Ohio J. Sci. 1959 : **59** : 289–302.

Woolly plants, having a profuse growth of epidermal hairs, are heterozygous for a semidominant lethal gene, lethal when homozygous. Embryological investigations have suggested that the lethal action of the homozygous gene pair probably takes place shortly before seed maturity. The F_1 of *Lycopersicon hirsutum* x woolly *L. esculentum* had both the longer epidermal hairs of the former parent and shorter ones of the latter. This composite character, designated superwoolly, indicated that the two species differ in the genes for hair growth.

2042 ALPATIEV [ALPAT'EV], A. V., ERINA, O. I. & BUGAREVICI [BUGAREVIČ], G. B.
Principiile de alegere a materialului inițial pentru obținerea unor pătlăgele roșii precoce prin metoda hibridării. **(Principles for choosing the initial material for obtaining early tomatoes by the method of hybridization).**
An. Romîno-Soviet.: Ser. Agric.-Zooteh. 1957 : **11** : No. 6 : 59–66.

[Cf. XXVIII, 3490].

2043 SAMSONOVA, I. A.
Folosirea metodei atomilor marcați pentru studierea apropierii vegetative prealabile. **(Utilization of the method of labelled atoms for the study of vegetative rapprochement).**
An. Romîno-Soviet.: Ser. Agric. 1957 : **11** : No. 3 : 75–79.

[Cf. XXVII, 4571].

2044 SZTEYN, K.
Trials to overcome the incompatibility of crosses between *Lycopersicum esculentum* and *Lycopersicum glandulosum* by repeated grafting.
Euphytica, Wageningen 1959 : **8** : 145–50.

In studies of five successive generations of reciprocal grafts of *L. esculentum* 'Moneymaker' and *L. glandulosum*, there were no differences between the grafts and the ungrafted controls in vegetative, floral or fruit characters, in disease resistance or in the seed sets of intraspecific and interspecific crosses.

2045 NIRK, H.
Interspecific hybrids of *Lycopersicum.*
Nature, Lond. 1959 : **184** : 1819–20.

Hybrids between *L. esculentum* and *L. peruvianum* var. *dentatum* have been produced at the Plant Breeding Laboratory, Melbourne, Vic., by reciprocally cleft-grafting the parents prior to crossing, which was successful only when the former species was used as ♀. The F_1 hybrids and selected segregates from later generations have been back crossed with *L. esculentum* as pollen parent. Families of the *L. esculentum* type with resistance to spotted wilt virus, combined in some cases with resistance to *Fusarium* wilt, have been secured.

2046 RICK, C. M. & HARRISON, A. L.
Inheritance of five new tomato seedling characters.
J. Hered. 1959 : **50** : 91–98.

Five mutants are described which should prove useful for genetical analysis of the tomato. Each is readily distinguishable at the seedling stage, normal in viability and sufficiently fertile. Four of the mutants are mainly characterized by various modifications of the leaf: (1) mouse ears, (2) *solanifolium*, (3) hastate and (4) *filicifolium*. An incompletely dominant gene, *Me*, determines (1). Mutant (4), conditioned by a single gene, *ff*, could also be classified as an incomplete dominant under field conditions but "for most purposes, and particularly for seedling segregations, *ff* is best treated as a recessive". The recessive genes *sf* and *ht* are respectively responsible for (2) and (3). The fifth mutant, an anthocyanin-deficient type, is recessive and monogenic (*ah*). Linkage relationships were determined for four of the mutations and three other genes affecting seedling characters, *Cu*, *rv* and *tf*. *Cu*, *ff* and *Me* were linked with markers of chromosome 2, the order d_1 — 12·5 — *aw* — 16 — *Me* — 3 — Wo^m being established. Gene *tf* was assigned the following position on chromosome 7: *wt* — 15 — *tf* — 30·5 — *mc*. A linkage detected between *ah* and *wd* provides chromosome 9 with its first known seedling marker. Gene *sf* was linked with *rv* on an unidentified chromosome.

2047 STRYDOM, E.
New tomato variety for High- and Middleveld.
Fmg. in S. Afr. 1959 : **35** : No. **6** : 14–15.

Red Kaki, a variety recently introduced from France, has proved resistant to late blight while producing good, medium-sized fruit, which is firm and transportable.

2048 HOLLAND, N. S. & LANA, E. P.
The Sheyenne tomato.
Bi-m. Bull. N. Dak. agric. Exp. Sta. 1959 : **21** : No. 2 : 16–17.

This new variety was selected from the cross (Stokesdale x Bounty) x Firesteel x a small-fruited, bushy selection from the Morden Experimental Farm, Morden, Man.

Of the same maturity class as Cavalier and Bounty, it outyields Cavalier, producing larger fruits, free from cracks. The flesh is firm and of good quality.

The superiority of the new variety is attributed to its better foliage cover, resulting in less disease and sun-scald problems.

2049 CERVATO, A. & VILLA, C.
Risultati di prove biennali di confronto di cultivar di pomodoro da pelati e da succo. (**Results of two years' comparative tests of cultivars of tomatoes for peeling and for juice**).
Ann. Fac. Agr., Milano 1959 : **71** : 80–95.

Trials were carried out in the province of Piacenza in northern Italy in 1957 and 1958 with a number of cultivars, which are described. They did not differ materially in fruit weight, density and locule number but acidity was greatest in Lampadina.

The dwarf variety Red Top was highest in yield and earliness but was difficult to peel and pale in colour; it is therefore recommended only for the preparation of juice. The two juice varieties, Garden and Canadese [Canadian], were both inferior in yield.

2050 FOSKETT, R. L.
Kenosha, a new canning tomato for Northern Colorado.
Pamphl. Colo. agric. Exp. Sta. undated : No. 5–S : Pp. 3.

Developed at the Colorado Agricultural Experiment Station, Kenosha is a selection from a cross between Alpine and Loran Blood. It

has given higher yields and shown better fruit quality than the varieties grown in Northern Colorado. The habit of Kenosha is indeterminate and the foliage protects the fruit from sun scald.
Improved canning varieties for the Arkansas valley and varieties for transport and the fresh market are also being developed. Dwarf varieties with heavy stems, a rigid upright habit of growth and fruits all ripening at the same time are being bred. This type of plant is suitable for mechanical harvesting. Progress has been made in incorporating resistance to *Verticillium* wilt in breeding lines.

2051 Gottschalk, W.
Die Bildung von Keimzellen mit euploiden Chromosomenzahlen aus triploiden und aneuploiden Pollenmutterzellen abregulierender polyploider Pflanzen. (**The formation of germ cells with euploid chromosome numbers from triploid and aneuploid pollen mother cells of polyploid plants tending to chromosome diminution**).
Z. VererbLehre 1959 : **90** : 198–214.

In some triploid PMCs of tetraploid plants of *Lycopersicon esculentum*, an atypical meiosis leading to the formation of three diploid gones was observed. Aneuploid PMCs with chromosome numbers between 3*n* and 4*n* showed similar behaviour and those chromosomes which were not included in the diploid nuclei formed small nuclei which in some cases degenerated. In many other polyploids where the aneuploid PMCs had between 2*n* and 8*n* chromosomes, both haploid and diploid gones were formed. In all cases the germ cells appeared to receive complete genomes and would therefore be fertile. Processes leading to reduction in the chromosome number are thought to occur in other plant species but at a lower frequency so that diploid progeny is not formed. Meiosis is considered to be a variable process and the modified form observed in polyploid tomatoes may result from the physiological conditions found in polyploid cells. [Cf. XXVIII, 4844 and 4845].

2052 Kononkov, P. F.
Rolul polenului soiului matern la încrucișarea diferitelor soiuri de tomate. (**The role of the pollen of the maternal variety in crossing between different varieties of tomatoes**).
An. Romîno-Soviet.: Ser. Agric.-Zooteh. 1958 : **12** : No. 4 : 52–55.

[Cf. XXIX, 846].

2053 Hille, M.
Ein einfaches Verfahren zur Infektion der Tomate mit *Synchytrium endobioticum* (Schilb.) Perc. [**A simple procedure for the infection of the tomato with *S. endobioticum* (Schilb.) Perc.**].
Phytopath. Z. 1959 : **36** : 394–405.

This simple method for testing for susceptibility to *S. endobioticum* involves pricking seedlings out on to pieces of plastic foam and immersing them for a few hours in water containing fresh tumours from infected potatoes.

2054 Goldenberg, J. B.
Método "standard" para la obtención de inóculo de *Septoria lycopersici* Speg., causante de la viruela del tomate. (**A standard method for obtaining an inoculation of *S. lycopersici* Speg., the cause of leaf spot in tomato**).
Rev. Invest. agríc., B. Aires 1959 : **13** : No. 1 : 105–10.

Cultures 14, 21, 28, 35 and 42 days old, obtained from fresh spores, were tested for spore production and spore germination. In the first two age groups, both spore production and germination percentage were high but in the older cultures germination diminished significantly although spore production increased. For use in resistance tests, cultures 14–21 days old are recommended.

2055 Sauer, M. R. & Giles, J. E.
A field trial with a root-knot resistant tomato variety.
Irrig. Res. Sta. tech. Pap. CSIRO Aust. 1959 : No. 3 : Pp. 10.

In a trial at Red Cliffs, Victoria, Australia, a local selection of HES4242, a derivative from a cross between *Lycopersicon peruvianum* and *L. esculentum*, was highly resistant to *Meloidogyne javanica*. Resistance decreased with successive plantings in the same soil and was lost after five crops as the result of selection of an aggressive strain.

2056 Riggs, R. D. & Winstead, N. N.
Studies on resistance in tomato to root-knot nematodes and on the occurrence of pathogenic biotypes.
Phytopathology 1959 : **49** : 716–24.

Roots of the resistant variety Hawaii 5229 were penetrated as easily as those of the susceptible variety STEP174 by each of the three nematode subspecies *Meloidogyne incognita incognita*, *M. incognita acrita* and *M. arenaria arenaria*.
Resistant plants, however, gave a hypersensitive reaction, producing, around the nematode,

necrotic tissue which stained deeply with safranin. Larvae penetrating resistant plants generally died within 96 hr., but in each case a few larvae survived to produce progenies which did not incite the hypersensitive reaction.
Maintenance of the progenies (here designated B populations) on susceptible plants did not affect their virulence on Hawaii 5229. The larvae of the three new populations are all significantly shorter in length than those of the parent populations and are concluded to be new pathogenic strains.

2057 RIGGS, R. D.
Studies on resistance in tomato to root-knot nematodes.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–349 : p. 2710. (Abst.).

Investigations on various aspects of resistance to *Meloidogyne incognita*, *M. incognita acrita* and *M. arenaria* are reported. The following observations may be singled out as being of particular interest. (1) Factors involved in resistance or susceptibility were situated in both the tops and roots but were not translocated across a graft union. (2) Study of differences between resistant and susceptible lines in proteases, alkaloids and phenols gave inconclusive results. (3) On the basis of histological observations, it is suggested that the hypersensitive reaction is associated with secretion of a toxin by the nematodes, which kills the host protoplasm. (4) When larvae from nematodes reproducing on resistant tomato plants were transferred continuously to other resistant plants, virulent populations of each of the three species were developed. These parasitized resistant Hawaii 5229 as severely as the parent populations attacked susceptible STEP 174. (5) B populations of all three species attacking the line carrying *Mi* were considered to be new physiological strains.

2058 **Curly-top resistant tomato.**
Crops & Soils 1959 : **12** : No. **1** : p. 20.
[Cf. XXIX, 4593].

2059 QUAGLIOTTI, L.
Possibilità di miglioramento genetico della melanzana (*Solanum Melongena* L.) in Piemonte. [**The possibilities of genetic improvement of the egg plant (*S. Melongena* L.) in Piedmont**].
Sementi elette 1959 : **5** : No. 5 : 38–45.

This review of the relevant literature is principally devoted to floral biology, parthenocarpy, the genetics of agronomic characters and the application of heterosis to yield improvement.

2060 MIWA, T., SAITO, Y. & YAMAMOTO, S.
(**The effect of plant hormones on interspecific and intergeneric hybridization in the Solanaceae**).
Miyazaki Daigaku Nogakubu Kenkyu Jiho/Bull. Fac. Agric. Univ. Miyazaki 1958 : **4** : No. 1 : 153–65. [Japanese].

The effects of α-naphthaleneacetic acid, indole-3-acetic acid, 245–T, 245–TP, 2,4–D and MH–30 on crosses involving *Capsicum annuum*, tomato, *Solanum integrifolium*, *S. melongena* and *Petunia violacea* are reported. In general, these growth substances proved useful in effecting or improving hybridization. Most of the crosses could only be made in one direction. Viable seed was obtained from the following: *S. melongena* x *S. integrifolium* and the reciprocal, *S. integrifolium* x *P. violacea*, *S. integrifolium* x tomato, tomato x *S. melongena*, *C. annuum* x *S. melongena* and *C. annuum* x *S. integrifolium*.

2061 MILLER, J. C., JONES, L. G. & WILSON, W. F. (JUN.).
Gold Coast, a new variety of okra.
Circ. La. agric. Exp. Sta. 1959 : No. 57 : unpaginated.

This new variety, released from the Louisiana Experiment Station, is the result of the cross Louisiana Market x an introduction (PI3650) from the African Gold Coast.
It is a dwarf plant bearing short round pods which are dark green in colour. The pods are firm and keep their shape during freezing and packing. The plants continue to fruit throughout the season and are heat tolerant.

2062 IONESCU, D. & POPA, G.
Linii noi de fasole. (**New lines of French bean**).
Anal. Inst. Cerc. agron. Romîn. 1957 (1958) : **25** : No. 6 : 253–65.

Four new lines, ICAR 2, 332, 334 and 416, have been obtained at the Moara Domnească experimental station by selection of local material from Banat. The selections show improvements in earliness (by 10–12 days), yield and quality compared with the original population.

2063 SATI NANDAN PRASAD
A note on factors affecting yield of "moong" *Phaseolus radiatus* varieties.
Indian Agric. 1959 : **3** : 50–53.

Yield trials were conducted on seven new varieties, BR1, BR2, BR3, BR4, BR5, BR6 and ST7, developed by pure line selection. Late-maturing strains were found to give considerably higher yields than early, although average seed weight varied little. Poor seed setting in the early-maturing strains is being investigated.

2064 Schwarze, P.
Untersuchungen über die gesteigerte Flavonoidproduktion in Phaseolus-Artbastarden (*Phaseolus vulgaris* x *Phaseolus coccineus*). [**Investigations on the increased flavonoid production in *Phaseolus* interspecific hybrids (*Ph. vulgaris* x *Ph. coccineus*)**].
Planta 1959 : **54** : 152–61.

The flavonoids of crosses between *Ph. vulgaris* 'Abessinische Auslese' [Abyssinian Selection] and selfed lines from *Ph. coccineus* 'Weisse Riesen' [White Giant] and of the parents were investigated using paper chromatography. The mature leaves of each parental species showed a different set of four different flavonoids; the offspring had all or some of the eight parental flavonoids and also some additional ones, 14 being the maximum number of flavonoids found in a hybrid. Some chromatograms of *Ph. coccineus* showed, in addition to the four flavonoids already mentioned, small quantities of other flavonoids corresponding to the extra ones in the hybrids. Thus it seems that some capacity for flavonoid synthesis which was latent or weakly expressed in at least one parent became fully expressed in the hybrids.

2065 Vargas Saco, R. & Brown V., L. R.
Producción de semilla seleccionada de frijol. (**Production of selected seed of French bean**).
Bol. trimestr. Exp. agropec., Progr. Coop. Exp. Agropec., Lima 1959 : **8** : No. 2 : 19–25.

The selection California LM–56 has proved well adapted at La Molina and in the Virú and Chincha valleys, Peru. Notes on the incidence of disease in this and other varieties are included.

2066 Nirad Kumar Sen & Chheda, H. R.
Colchicine induced tetraploids of five varieties of black gram.
Indian J. Genet. 1958 : **18** : 238–48.

Colchicine treatment of the seeds of *Phaseolus mungo* was unsuccessful in inducing polyploidy but seedling treatments involving the application of a 0·25 or 0·5% solution to the apical bud for various periods of time yielded in all cases some plants which were either completely or partially polyploid. In most of the experiments about 50% of the treated plants had polyploid sectors. The variety BR61 yielded fewer polyploids than the other varieties. The tetraploid plants were smaller and more bushy than the diploids and the leaves were smaller, thicker and darker. Also the inflorescence of the polyploids was shorter with fewer flowers and the pods were shorter with fewer seeds. However the polyploids had bigger floral parts and bigger seeds than the diploids. The pollen fertility of the polyploids was 75–80%, that of the diploids being 95%, but the polyploids had a much lower seed set. Only a few irregularities were observed during meiosis in PMCs of the polyploids; the frequency of quadrivalents was fairly low but a fair number of triads, pentads, hexads and septads were observed.

Varietal differences were observed between the polyploids in morphological characters, pollen stainability, fruit set and other characters.

2067 McAnelly, C. W.
Free amino acids in the cultural media and cells of *Fusarium solani* f. *phaseoli*.
Phytopathology 1959 : **49** : 734–37.

Free aminoacid content was determined in twenty *Fusarium* isolates which had shown various abilities to produce root rot in beans under greenhouse conditions. The four most virulent strains were found to differ significantly from the four least virulent strains in their glutamic acid, glycine and alanine content.

2068 Olave L., C. A.
Resistencia de algunas variedades y líneas de fríjol (*Phaseolus vulgaris* L.) al *Isariopsis griseola* Sacc. [**Resistance of some varieties and lines of French bean (*Ph. vulgaris* L.) to *I. griseola* Sacc.**].
Acta agron., Palmira 1958 : **8** : 197–219.

In studies of the pathogenicity of *I. griseola* on the variety Algarrobo [Carob], no differences in degree of infection were found between plants inoculated at 20 and at 30 days of age. Inoculation tests of ten varieties and two lines showed that México 11, México 12 and Cauca 27a were highly resistant, Sánchez resistant and Sangretoro, Liborino and lines 133 and 138 moderately resistant.

2069 Allard, R. W. & Clement, W. M.
Linkage in lima beans.
J. Hered. 1959 : **50** : 63–67.

Twenty-two loci were tested for linkage. Ten linkages were found which, together with four previously reported, may be arranged in four groups: (1) $P–R–L_4–Wl–D–L_{18}$; (2) $S–L_1$; (3) $L_2–C–Ms_1–L_{16}$; (4) $B–G$. The characters controlled by genes at these loci are: *Pp*, reddish purple *v.* red seedcoat; *Rr*, dark red *v.* red seedcoat; L_4l_4, green *v.* yellow plant; *Wlwl*, lanceolate *v.* ovate leaflet; *Dd*, indeterminate *v.* determinate habit; $L_{18}l_{18}$, green *v.* dwarf yellow plants; *Ss*, mottled *v.* self-coloured testa; L_1l_1, green *v.* yellow leaf; L_2l_2, green *v.* yellow plant; *Cc* red *v.* white testa, *C* being necessary for the expression of all other genes for testa colour; Ms_1ms_1, fertile *v.* male sterile; $L_{16}l_{16}$ green *v.* yellow plant; *Bb*, presence *v.* absence of a blue ground colour in immature beans in the presence of *C* [cf. XXVIII, 1036]; and *Gg*, white *v.* green cotyledon.

2070 BEMIS, W. P.
Selective fertilization in lima beans.
Genetics 1959 : **44** : 555–62.

Male gametes carrying a recessive gene *ga* were deficient in effecting fertilization on *Ga/ga* stylar tissue, when in competition with *Ga* gametes. Loci *D* (plant habit), *Wl* (leaflet shape) and *R* (testa colour) were found to be in the same linkage group as locus *Ga*, with which they had recombination values of 39·37 ± 1·64, 42·56 ± 3·57 and 45·33 ± 3·65% respectively. *D* was between *R* and *Ga*, with a recombination percentage of 22·11 ± 2·27 between *R* and *D*. *D* and *Wl* were very closely linked, the recombination value being 1·8 ± ·4%. The spatial arrangement was not determined for these two loci. Linkage calculations involving locus *Ga* were based on the assumption that *ga* gametes were completely inhibited from effecting fertilization on *Ga/ga* stylar tissue when in competition with *Ga* gametes. Further recombination data for genes closely linked with *Ga* are required in order to answer the questions of whether a certain proportion of *ga* gametes may in fact effect fertilization when under competition or whether additional alleles are present at *Ga* which may affect fertilization.

2071 MACKIEWICZ, Z.
Postępy w aklimatyzacji i hodowli soi w Polsce. (**Progress in the acclimatization and breeding of soya bean in Poland**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1958 : **2** : 289–312.

A fuller account of this work has already been abstracted [cf. XXVII, 3580].

2072 PAVEL, I. G.
Linii noi de soia. (**New lines of soya bean**).
Stud. Cercet. şti., Biol. Şti. agric. Iaşi 1957 : **8** : No. 1 : 119–33.

A number of promising new lines have been obtained at Iaşi by individual-plant selection of existing varieties. Lines Iaşi 50/2 (selected from Dobrogea), Iaşi 50/4 (from Galbenă romînească [Rumanian Yellow] and Iaşi 50/5 (from Fleischmann) have given notable yield increases compared with the standard Galbenă de Platt [Platt Yellow] and improved protein and fat contents.

2073 GHEIKING, A. & SĂNDULEAC, E. V.
Contribuţii la îmbunătăţirea culturii soiei. (**Contributions to the improvement of soya-bean cultivation**).
Probl. Agric., Bucureşti 1958 : **10** : No. 4 : 69–77.

Descriptions are included of varietal trials carried out in various localities in Rumania in 1953–56. The best variety in respect of yield and protein and oil content was Herb 620.

2074 WEBER, C. R. & WEISS, M. G.
Chlorophyll mutant in soybeans provides teaching aid.
J. Hered. 1959 : **50** : 53–54.

The mutant described depends upon y_{11}. When homozygous, y_{11} results in bright yellow plants which die when the cotyledonary reserves are exhausted. $Y_{11}Y_{11}$ plants are a normal green, the heterozygotes light green. The difference in colour between $Y_{11}Y_{11}$ and $Y_{11}y_{11}$ persists until shortly before maturity; although somewhat below the normal green plants in vigour, the heterozygotes are not seriously impaired in seed production.

2075 TANG, W.-T. & CHEN, C.-H.
(**Studies on the technique of soya-bean hybridization**).
Tai-wan Ta-hsueh Nung-hsueh-yuan Yen-chiu Pao-kao/Mem. Coll. Agric. Taiwan Univ. 1958 : **5** : No. 3 : 1–5. [Chinese].

Hybridization was most effective when emasculation and pollination were performed at 5–7 p.m. Bud pollination was the most efficient emasculation procedure. The percentage of pods with selfed seed decreased from 10 to 0% when alcohol was applied at concentrations ranging from 30 to 60%; however, the percentage of pods with hybrid seeds dropped concurrently from 32 to 2%.

2076 **USDA releases Hill, new soybean variety.**
Seed World 1959 : **85** : No. 3 : p. 31.

East has new soybean.
Agric. Res., Wash. 1959 : **8** : No. 3 : p. 16.

CAVINESS, C. E. & WALTERS, H. J.
Hill, a new early-maturing soybean.
Arkans. Fm. Res. 1959 : **8** : No. 4 : p. 2.

Hill, a widely adapted, early-maturing variety, is resistant to lodging, shattering, *Xanthomonas phaseoli* var. *sojensis*, *Pseudomonas tabaci*, *Cercospora sojina*, *Phytophthora* rot and purple seed stain. In addition, it appears to be resistant to root-knot nematode. The variety was developed from a cross between two experimental lines, D632–15 and D49–2525.

2077 BERNARD, R. L.
Shelby soybean for southern cornbelt.
Crops & Soils 1959 : **12** : No. 1 : p. 20.

Shelby, developed from the back cross Lincoln x (Lincoln x Richland), is similar to Clark in habit and the colour of the flowers, pods and seeds but it matures six days earlier. It resembles Lincoln in height, lodging resistance and oil and protein content of the seeds. Shelby has outyielded Lincoln and Adams and is equal to them in other respects. Some information on this variety has already been summarized [cf. XXIX, 2060].

2078 KLYKOV, A. P.
(The questions of growing soya bean in the south of the Chernozem zone).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1959 : No. 2 : 9–13. [Russian].

Saljut 216 [Salute 216] was the most productive of seed and green matter among new early varieties bred in the Soviet Far East which ripen seed in the province of Rjazan. Amur 253 and Amur 283 exceeded all the others in earliness. Saljut 216, Rekord Severnyj [Northern Record] and Amur 253, when grown in the new environment, acquired changes in shape and colour of seed and Amur 253 also gave rise to a new morphological variant.

2079 UEKI, K. & IGAWA, M.
(The influence of high night temperature on soya-bean growth).
Kagawa Daigaku Nogyobu Gakujutsu Hokoku/Tech. Bull. Fac. Agric. Kagawa Univ. 1958 : **9** : 111–18. [Japanese].

Marked intervarietal differences were noted in the alterations in the rhythm of development induced by high night temperatures, before or after flowering.

2080 WANG, C.-L. & WU, H.-L.
(Studies on the problem of breeding soya beans for height of attachment of the pods).
Nung-yeh-hsueh Pao (J. Agric.)/Act. Agric. sin. 1959 : **10** : 129–34. [Chinese].

In order to harvest soya beans by means of a combine, increased pod height is desired. A study was therefore made of pod height in 50 varieties during 1949–56. It was found that this character is much affected by environmental conditions and is positively correlated with period to flowering, maturation period and plant height, the respective correlation coefficients being $r = 0{\cdot}7155$, $0{\cdot}8409$, and $0{\cdot}5787$. It is suggested that these last characters, together with lodging resistance, should be used in breeding for adaptability to combine harvesting.

2081 KO, S.-C.
(Ecotypes of soya bean in respect of pod-setting habit and its importance in work on varieties).
Nung-yeh-hsueh Pao (J. Agric.)/Act. agric. Sin. 1959 : **10** : 197–203. [Chinese].

Three ecotypes are distinguished and data are provided on their yielding potentialities and associations with other plant characters. The significance of these findings in recommending varieties for north-east China is discussed.

2082 HAN, Y.-S.
(Soya-bean diseases in Taiwan).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China: New Ser. 1959 : No. 26 : 31–38. [Chinese].

Notes on varietal susceptibility to the following diseases are included: dwarf, mosaic, *Phakopsora sojae*, *Cercospora kikuchii*, *C. sojina*, *Glomerella glycines*, *Fusarium oxysporum*, *Fusarium* seed rot, *Peronospora manshurica*, *Sclerotinia sclerotiorum*, *Pseudomonas glycineum*, *Xanthomonas phaseoli*, brown spot, *Corticium centrifugum*, *Helicobasidium mompa* and *Macrophoma mame*. None of the 150 varieties tested was immune from any disease.

2083 HILDEBRAND, A. A.
A root and stalk rot of soybeans caused by *Phytophthora megasperma* Drechsler var. *sojae* var. nov.
Canad. J. Bot. 1959 : **37** : 927–57.

Information on varietal reactions and breeding for resistance to the above disease, now prevalent in southwestern Ontario, is included. Greenhouse tests of commercial varieties by the tooth-pick method of stem inoculation indicated two well-defined types of reaction, resistance and susceptibility. Blackhawk, Monroe, Illini, Harley, AK (Harrow) and Mukden fell into the resistant class. Breeding for resistance was initiated in 1957 by tests of advanced hybrid lines available at the Dominion Experiment Station, Harrow, Ont.

2084 Crittenden, H. W.
Production of lateral roots in soybean varieties resistant and susceptible to *Meloidogyne incognita acrita.*
Phytopathology 1959 : **49** : p. 523. (Abst.).

Two varieties, Virginia and Adams, susceptible to root-knot nematode and two resistant varieties, Laredo and Anderson, were exposed to *M. incognita acrita* for periods of 8, 16 and 32 days and were also grown in uninfested soil. The susceptible varieties affected by nematodes were found to produce fewer tertiary roots than the same varieties grown in uninfested soil; this was apparently due to the enlargement of the pericyclic region in numerous areas of the secondary roots. Tertiary root production in the resistant varieties was the same when grown on uninfested or infested soil.

2085 Matsumoto, S. & Kurosawa,* T.
(On the effect of differences in mode of growth of soya beans on injury caused by *Grapholitha glycinivorella.*)
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1959 : No. 74 : 92–99. [Japanese].

A negative correlation was discovered between date of maturation of the pods of different varieties and the degree of infestation of the pods and seeds by the insect, this correlation being stronger in pubescent than in glabrous varieties. A negative correlation was also obtained between infestation and percentage of small pods (2–3 cm.). [Cf. XXIX, 871].

2086 Gelin, O., Ehrenberg, L. & Blixt, S.
Quantitative studies of induced mutations in peas II. Mutagenic effect of oxygen.
Agri hort. genet., Landskrona 1959 : **17** : 265–74.

Treatment of seeds of the pea Weitor (Weibull's 702), with O_2 at 50 atm. for up to 54 days resulted in: linear decreases in survival percentage and plant height with increasing dose; decreases in numbers of branches per plant and seeds per branch; increases in number of disturbed anaphases in the first division after the onset of germination; and, compared with the control, a highly significant increase in mutation rate. The effects appeared to resemble those of X irradiation [cf. XXIX, 3273] in (*a*) the efficiency of induction, (*b*) the broad mutation spectrum induced, (*c*) the restriction of the mutated sector to one branch and (*d*) the deficit of plants homozygous and heterozygous for the mutation in the X_2 and of homozygous plants in the X_3.

2087 Arončuk, M. M.
(The early pea Timirjazev 49).
Izv. Timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1959 : No. 4 : 217–21. [Russian].

Timirjazev 49 was obtained at the Breeding and Genetics Station of the Timirjazev Agricultural Academy by crossing an early American pea with a late sugar pea from Jaroslavl'. It has an appreciably shorter growth period and is more productive than Capital and Moscow 572. The seed of the new variety is larger than that of Capital and its cooking quality and flavour are rated higher.

2088 Tuveson, R. W. & Garber, E. D.
The virulence of biochemical mutants of *Fusarium oxysporum* f. *pisi.*
Genetics 1959 : **44** : p. 543. (Abst.).

Nine varieties of *Pisum sativum* were inoculated with biochemical mutants of *F. oxysporum* f. *pisi.* The mutants displayed various patterns of virulence and avirulence. No mutant was virulent for all varieties. Some mutants were avirulent for all varieties. These and other observations suggested that the varieties differed in biochemical constitution, at least quantitatively.

2089 MacNeill, B. H. & Howard, H.
Near-wilt of peas in Ontario.
Canad. J. Pl. Sci. 1959 : **39** : 483–90.

The presence of race 2 of *Fusarium oxysporum* f. *pisi* has been demonstrated in the resistant variety New Era. Invasion was not as extensive as in the susceptible variety WR Perfection and the plant showed no symptoms externally.

2090 Buxton, E. W.
Production of a perfect stage in a nutritionally deficient mutant of pathogenic *Fusarium oxysporum* after ultra-violet irradiation.
Nature, Lond. 1959 : **184** : p. 1258.

After irradiation, a British isolate of *F. oxysporum* f. *pisi* proved to be deficient in methionine and arginine synthesis. Further irradiation of the mutant resulted in additional deficiencies in cystine and vitamin B_1 synthesis. The mutant retained its capacity to cause wilting in pea and readily formed heterocaryons with other marked strains of *F. oxysporum* f. *pisi* but failed to form stable heterocaryons with *F. solani* f. *pisi*. The mutant subsequently produced perithecia and this perfect stage was identified as the tropical species *Nectria haematococca*. Whether this homothallic *Nectria* arose as a direct result of ultraviolet irradiation or was the indirect outcome of altered nutritional requirements is an open question, but possibly the genetic system governing perithecia formation in this particular isolate may have been unmasked by irradiation damage to nuclear material which had previously suppressed production of perithecia.

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* Transliterated as Katrsumura in the journal

2091 Kim, W. S. & Hagedorn, D. J.
Streak-inciting viruses of canning pea.
Phytopathology 1959 : **49** : 656–64.

Two new North American pea streak viruses, MS and PO, have been discovered, and a new strain (Idaho strain) has been isolated from the Wisconsin pea streak virus. All three viruses were highly infective on all of the sixteen pea varieties tested.

The Idaho strain of the Wisconsin virus resembles the original virus in symptoms and physical properties. It differs in its ability to be transmitted by the pea aphid (*Macrosiphum pisi*) and in being inactivated *in vitro* within a week.

The MS virus is also transmitted by pea aphids and causes extensive necrotic streaking on stem, petioles and veins. The PO virus causes a characteristic necrosis of the top of all susceptible leguminous plants.

2092 Zaumeyer, W. J. & Patino, G.
A recently discovered virus-induced streak of peas.
Plant Dis. Reptr. 1959 : **43** : 698–704.

All of 119 varieties inoculated with a new strain of pea streak virus isolated in southern Idaho proved susceptible. Yellow Admiral, Nome, Pedigree Extra Early, Willet Wonder and Eureka showed mild symptoms only. The first three of these had a large proportion of healthy plants in the tests.

2093 Bhide, V. S.
A preliminary note on varietal differences in the scale leaves in gram. (*Cicer arietinum*).
Sci. & Cult. 1959 : **25** : 201–02.

The three varieties examined differed in the dentition, shape and size of their scale leaves.

2094 Deshmukh, N. Y. & Mitkari, G. D.
"Some observations on the practice of topping in gram (*Cicer arietinum* Linn.)".
Nagpur agric. Coll. Mag. 1959 : **33** : 10–12.

Varietal differences were observed during these trials.

2095 Deshmukh, N. Y.
"Sterile mutants in tur (*Cajanus cajan*)".
Nagpur agric. Coll. Mag. 1959 : **33** : 20–21.

Two sterile mutants are described. One, from strain 175, grew to a height of 9 ft. compared with the parents' 5½ ft. and was unbranched. The other, from strain 148, possessed large, simple leaves. The flower buds developed into bunches of thread-like, green sepals.

2096 Richardson, D. L.
Effect of certain endosperm genes on popping ability in popcorn.
Agron. J. 1959 : **51** : p. 631.

Fourteen endosperm genes of dent origin were introduced into popcorn, usually three back crosses to popcorn being effected. In addition, the effects of the genes controlling the following popcorn mutants were studied: P32-brittle, 1533-shrunken, P303-starchy, new waxy and new starchy. When heterozygous, the recessive genes had no effect on popping expansion, although fl_1 (floury-1) and fl_2 (floury-2), which exhibit dosage effects, and the dominant new starchy gene had an influence in the heterozygous condition. As expected, the defective endosperm types due to sh_2 (shrunken-2), P32-brittle, bt_1 (brittle-1) and su_1 (sugary-1) showed a drastic reduction in popping ability. Defective types with less severe effects on starch accumulation, viz. sh_1 (shrunken-1) and 1533-shrunken, had a more moderate inhibitory effect. Genes *ae* (amylose extender), su_2 (sugary-2) and *du* (dull) caused a marked reduction in expansion but *wx* (waxy) had a relatively slight effect. No conclusion was reached as to the possible role of amylose in popping ability. That genes such as o_1 (opaque-1), o_2 (opaque-2), P303-starchy, *h* (soft starch) and new starchy reduced popping was expected, since it is known that an inverse relationship exists between proportion of soft starch and expansion. Differences in popping scores within this group may be a reflexion of disparities in the extent to which the genes in question cause substitution of the corneous popcorn endosperm by starchy tissue. Although the inhibitory effect of *wx*, *h* and new starchy was relatively slight, the popping ability associated with these genes was low compared with that of normal popcorn. It appears that the quantitative genes controlling expansion operate at a different level of influence from that of the 19 genes studied.

2097 IKEDA, N. & UDO, S.
(Studies on mint breeding. X. Artificial triploids of Japanese mint).
Ikushugaku Zasshi/Jap. J. Breeding 1959 : **9** : 21–27. [Japanese].

Triploids were obtained by crossing induced tetraploids ($2n = 192$) ♀ with diploids ($2n = 96$) ♂. They were somewhat larger than the diploids. The essential oil content of the triploids was usually between the parental values but no correlation between hybrid and mid-parental values was obtained. Content of free menthol sometimes exceeded the mid-parental values and was closely correlated with them ($r = 0{\cdot}983$).

The modal metaphase configuration of the triploids was $48_{\mathrm{I}} + 48_{\mathrm{II}}$ though up to three trivalents were sometimes found. It thus appears that Japanese mint is allopolyploid. Numerous lagging chromosomes occurred at meiosis and pollen-tetrad formation tended to be anomalous. The fertility of the triploids was very low. [Cf. XXIX, 2079].

2098 IKEHATA, Y. & NAKAYAMA, T.
(The classification of mint varieties of warm regions into growth types and their physiological and ecological characteristics. I. The classification of Japanese mint varieties into growth types).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. Exp. Sta. 1958 : No. 56 : 59–76. [Japanese].

Five varieties of Japanese mint could be classified into three groups: (1) with propagation chiefly by overground laterals; (2) with propagation equally by overground laterals and rhizome shoots; and (3) with propagation chiefly by rhizome shoots. Data are provided on the oil content and on the proportion of free menthol, ester menthol and menthone in the oil of the five varieties.

2099 IKEHATA, Y., TSUBOI, H. & ANDO, S.
(The classification of mint varieties of warm regions into growth types and their physiological and ecological characteristics. II. The characteristics of the distribution of the root system).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. Exp. Sta. 1958 : No. 56 : 77–84. [Japanese].

A comparative study of 16 Japanese mint varieties showed that in varieties of group (1) of the preceding abstract the roots mainly develop downwards while in varieties of group (3) they tend to grow horizontally. The roots develop in both directions in varieties of the intermediate group (2). Plant height and root depth are linearly correlated.

2100 NAGASAWA, T.
(Studies on the progress achieved with Japanese mint. VI. Studies on chemical methods for discriminating between mint varieties. 1. Colour reactions of the essential oils).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. Exp. Sta. 1958 : No. 56 : 163–82. [Japanese].

Numerous tests whereby mint species can be distinguished by the terpenoid content of their essential oils are described. In some cases, varieties of Japanese mint can be distinguished from one another also by these means.

ECONOMIC LOWER PLANTS

2101 IMŠENECKIJ, A. A.
(Some aims in breeding micro-organisms).
Vest. Akad. Nauk SSSR (Rep. Acad. Sci. USSR) 1959 : No. 10 : 32–38. [Russian].

The use of ionized radiation in induction of economically useful bacteria, fungi and yeasts is discussed. Current aims are techniques for securing specific mutants, maintenance of variants without deterioration, and investigation of correlations between biochemical and morphological properties of mutants to facilitate selection.

2102 SHIMWELL, J. L.
Re-assessment of the genus *Acetobacter*.
Leeuwenhoek ned. Tijdschr. 1959 : **25** : 49–67.

Attempts to classify *Acetobacter* according to morphological, cultural and biochemical criteria all proved unsuccessful, since all the strains studied were unstable and proved capable of mutating into other types corresponding to known or new species; these would then give rise to further mutants. The possibility that the pleomorphism of *Acetobacter* involves some kind of cytoplasmic variation or some method of reproduction other than simple fission is suggested.

2103 Alihanjan, S. I. & Ždanov, V. G.
[The effect of combined action of physical and chemical mutagens on mutations in polygenic systems of microorganisms (the erythromycin producer *Actinomyces erythreus*)].
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **125** : 1353–55. [Russian].

Experiments on induction of mutations in *Actinomyces* (*Streptomyces*) *erythreus* by means of ultraviolet rays, X rays, ethyleneimene and combined effects of this chemical with X and ultraviolet rays are reported. The greatest number of mutants resulted from treatment with ethyleneimene first, followed by ultraviolet irradiation. Variant 2577, obtained by this method, produced more erythromycin than any of the other mutants; it was 75–100% more productive than the initial strain under laboratory conditions.

2104 Bradley, S. G.
Cross-resistance patterns of mutants resistant to *Streptomyces* phages.
Mycologia 1959 : **51** : 125–31.

The reaction of mutants of seven strains of *Streptomyces* to 12 bacteriophages of different origin was investigated and it was found that resistance to one phage frequently conferred resistance to others. Strain S104 of *S. griseus* was sensitive to 11 phages but a variant selected for resistance to phage W2 was sensitive to only four phages and a selection of *S. griseus* 'S86' resistant to W4 was found to be resistant to all the other phages. In a few cases selection for resistance to one phage led to sensitivity to another; a mutant of *S. venezuelae* 'S13' resistant to M4 was susceptible to L3 though the parent S13 was resistant to this phage. The phages were classified into groups according to the cross resistance patterns and similar relationships were noted between the *Streptomyces* strains. As regards phage susceptibility, *S. griseus* 'S86' resembled *S. venezuelae* 'S13' more than *S. griseus* 'S1945'. Resistance was not the result of lysogenization.

2105 Szabó, G.
Studies on the resistance to streptomycin of *Streptomyces griseus*. III. The effect of temperatures suboptimal for growth on the development of resistance.
Acta biol., Budapest 1959 : **9** : 351–53.

The number of resistant colonies produced was several times greater at 17° C. than at 27° C., the optimum temperature for growth; at 10° C. the number was much lower. Preincubation at 17° C. also increased the number of resistant colonies, the increase being positively related to the duration of preincubation.

2106 Kiritani, K.
Selection of fitter type nuclei in heterocaryons of *Aspergillus oryzae*.
Z. VererbLehre 1959 : **90** : 182–89.

The growth of *y lys f* (yellow, lysine dependent and less fit for casein medium) and *w leu f* (white and leucine dependent) mutants on various media was investigated and a fast grower, *y lys F*, was isolated. Heterocaryons were produced between *y lys F* and *w leu f* mutants growing on a casein-containing medium. Growth rates showed the relationship $F \geqslant F + f > f$ in the middle part of the growth tube. Under aerated conditions the relationship was $F > F + f > f$ and the *F* mutant was at a selective advantage.

2107 Kiritani, K. & Ikeda, Y.
Heterosis observed in *Aspergillus oryzae* and its significance in koji manufacture.
Z. VererbLehre 1959 : **90** : 190–97.

The mutant *y lys F*, which grows fast on a casein medium [cf. 2106], showed greater protease activity than its parent strain and slower-growing sister strains. Usually the *F* mutant produced protease at a later stage of growth than the sister strain. A heterocaryon between two slow-growing strains produced protease both early and late in development, the activity increasing beyond the production limit of either component strain; this is thought to be an heterotic effect. A heterozygous diploid between two slow-growing strains equalled the heterocaryon in protease activity. The highest enzyme activity was found in a diploid resulting from the pairing of a fast and a slow grower.

2108 Tihomirova, A. S.
(Adaptivity of amylolytic enzymes of *Aspergillus oryzae*).
Mikrobiologija (Microbiology), Moskva 1959 : **28** : 45–51. [Russian].

It was found that amylase, dextrinase and maltase were synthesized in submerged cultures from nonspecific sources of carbon such as cellulose, inulin, sucrose, mannose, xylose, mannite, glycerol, sodium acetate, sodium malate and ammonium succinate. The induction of adaptive amylolytic enzymes by these nonspecific substrates suggests that there is no qualitative distinction between adaptive and constitutional enzymes.

2109 Karasevič, Ju. N.
(The adaptation of yeasts to pentoses. III. Developmental characteristics of initial and adapted *Candida* cultures on substrates with arabinose).
Mikrobiologija (Microbiology), Moskva 1959 : **28** : 191–96. [Russian].

All nonadapted strains of *C. tropicalis* grew slowly on arabinose when it was the only source of carbon available to them. As the strains became adapted to arabinose the activity of their aribinose-oxidizing enzymes increased and their capacity to form cell proteins from intermediary oxidation products improved.

2110 Och, F. F.
A physiological study of conjugation in the yeast *Hansenula wingei* (Hansen) Wickerham.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–1592 : p. 3092. (Abst.).

The oxygen consumption of the two haploid strains Y–2340–5 (NRRL) and Y–2340–21 (NRRL) was measured in the presence of various carbon sources and at pH 5·0, pH 6·0 and pH 7·0. When mixed the two strains agglutinate and are able to form zygotes. When the ratio of the oxygen consumption of the mixture to the sum of the values of the individual strains was 1·10 or greater, fertilization was considered to have taken place, and such ratios were found for glyceraldehyde at pH 6·0 and 7·0, citric acid at pH 6·0, acetic acid at pH 6·0 and 7·0, gluconic acid at pH 5·0 and glucono-d-lactone at all pHs. The summed oxygen consumptions ranged from a relative value of 100 for glucose at pH 5·0 to 25 for citric acid at pH 7·0. The decrease in consumption with increasing pH was generally greater for acids than for the other substrates.

2111 Roberts, C. & Ganesan, A. T.
The occurrence of multinucleate giant cells in yeasts.
Leeuwenhoek ned. Tijdschr. 1959 : **25** : 97–107.

The spontaneous occurrence of giant cells containing 1–6 nuclei is reported for young cultures of *Lipomyces lipofer* and three different *Saccharomyces* genotypes. Rapidly growing cultures from isolated giant cells reverted at varying rates to populations of small uninucleate cells which, although not genetically analysed, appeared normal in all respects.

2112 Winge, O. [Ø].
Yeast hybridization.
Brew. Dig. 1959 : Apr. : 46–52.

In this short general review reference is made to (1) spore crossing, (2) heterothallism and the crossing of haploid cells, (3) the relative advantages of spore crossing and mass mating as crossing methods, (4) the use of artificial hybridization in producing new industrial types of yeast and its practical limitations, and (5) some of the genetic factors involved in the fermentation of different yeasts.

2113 Gutz, H.
Über das Erbverhalten eines Backhefe-Stammes (*Saccharomyces cerevisiae*). [**The hereditary behaviour of a baking yeast strain (*S. cerevisiae*)**].
Züchter 1959 : **29** : 251–54.

Tetrad analysis of a strain of *S. cerevisiae* was carried out and about half of the single-spore cultures produced ascospores; some of these were then subjected to further tetrad analyses and they also segregated into sporulating and mating strains. Of the 40 single-spore cultures capable of mating, only two were of the α type, the others being of the *a* type. Attempts are made to explain these results, assuming that the strain is polyploid, that extra divisions of the nucleus take place in the ascus, and that a lethal factor is linked with the α allele.

2114 Lindegren, C. C. & Pittman, D.
The "all-or-none" nature of X-ray induced backmutation at the melezitose locus in *Saccharomyces*.
Genetica 1959 : **30** : 169–89.

The authors give a detailed account of investigations on locus *MZ* for melezitase formation [cf. XXIX, 892] and develop hypotheses concerning enzyme synthesis and the nature of *MZ*. "It is proposed that the *MZ* locus is a 'conformation' and that the 'conformations' of the partially recessive genes do not precisely resemble the conformation of the dominant (*TMSGZ*) allele, but that the partially recessive alleles can be specifically 'remodelled' by contact with the mutagenic substrate and that this remodelling effects the mutations. In contrast to the partially recessive alleles (*TMSgZ*, *TMSGz*, *TMSgz*, *TMsgz* and *Tmsgz*), the recessive allele (*tmsgz*) cannot be remodelled until treatment with X-rays has rendered it 'plastic' or altered it sufficiently so that some faint resemblance of the primary model has been produced." This conformation is regarded as consisting of "elements" which are oriented in specific "patterns", a conformation being defined "as a gene in the sense that crossing-over does not occur within it and that rearrangements and disarrangements in the 'elements' are due to some process other than crossing-over." The contact of a specific inducer with a specific pattern initiates enzyme production. A single change in a pattern of the *MZ* conformation effects a specific loss in ability to respond to one or more inducers, since a change in an element of one pattern may make that pattern and all distal patterns nonfunctional. It is assumed that the gene system responsible for enzyme synthesis involves at least three components: (1) the "receptor" of the substrate, (2) the "conductor" which conveys the stimulus produced by contact between receptor and substrate, and (3) the "effector", controlling enzyme synthesis [cf. XXIX, 1178]. Enzyme synthesis is nonspecific in that the same enzyme is produced when several different inducers activate the receptor. "Several identical receptors are arranged around the chromosome at each locus of the mitotic cell, thus insuring transfer of an adequate number of receptors to each daughter cell when the chromosome splits. The stimulus from receptor to effector passes along the chromosome (DNA) to the effector where a specificity-conferring molecule, presumably RNA, is synthesized which can pass through the nuclear membrane and confer specificity to an enzyme synthesized in the cytoplasm. The receptors (which are multiple during mitosis) are represented singly on the chromosomes during the leptotene of meiosis."

2115 JAMES, A. P.

Dominance and overdominance in radiation-induced mutations affecting a quantitative character in yeast.

Genetics 1959 : **44** : p. 518. (Abst.).

X-ray-induced and spontaneous mutations affecting rate of cell division were assayed for dominance and overdominance. The mutations varied in type from recessive lethal to those reducing rate of division in the haploid by as little as 3·5%. The mean growth rate of the heterozygotes for 29 recessive lethals or sublethals was 8% lower than that of nonmutant diploid controls. A significant reduction in rate of division was detected in 19 of these heterozygotes, the reductions ranging from over 30% to less than 2%. A significant increase (1%) in rate was found in one heterozygote. The mean rate of division of heterozygotes for 29 "negative but nonlethal" mutations was 2% lower than that of the controls. Significant reductions in rate, ranging from 12 to less than 2% were found in 13 of the heterozygotes and significant increases (2 and 3%) in two.

2116 SHULT, E. E., LINDEGREN, C. C. & DESBOROUGH, S.

The application, to tetra-analysis-data from *Saccharomyces*, of principles for establishing the order of genetic factors.

Genetics 1959 : **44** : p. 535. (Abst.).

Empirical criteria used in establishing the order of loci define, rather than prove, linear order. The degree of certainty of linear order depends upon the mutual confirmation of a series of independent applications of the criteria. That the single application of an ordering principle to one set of three-point data does not comprise a demonstration of linear order is proved by either (1) inconsistencies in gene order when the principle is applied to a linkage group containing four or more loci or (2) nonlinear gene arrangements. Three ordering criteria have been defined and applied to five genes in chromosome I in *Saccharomyces*. On the basis of ten sets of three-point tetrad data, the linear order *UR–SH–HI–IS–AN* was defined by all three criteria. Of the 30 independent tests, three defined the order of the five loci, 21 confirmed this order, two contradicted it and four were inconclusive. The exceptions implied that interregional chromatid interference was stronger than that operating intraregionally. This conclusion was supported by a direct analysis of double recombinations, which exhibited significant chromatid interference between compound regions but subsignificant interference between adjacent simple regions. *TH*, also a member of linkage group I, departed significantly from a linear arrangement. The *TH* arm "branched" from chromosome I near the centromere, between *UR* and *CH*. It was inferred that the branch resulted from preferential segregation of centromeres producing quasilinkage. [Cf. XXIX, 3292].

2117 LINDEGREN, C. C.

Cytoplasmic inheritance.

Ann. NY Acad. Sci. 1957 : **68** : 366–79.

Cytoplasmic inheritance in yeast is discussed with reference to theories on tissue differentiation, which is regarded as an example of cytoplasmic inheritance. According to Warburg's theory of tissue differentiation, the materials which maintain the integrity of differentiated tissue are synthesized oxidatively in cytoplasmic granules, and his suggestion that anaerobiosis might lead to loss of aerobic respiratory ability has been confirmed by experiments in yeasts.

Beerman found that different genes are active in different tissues, suggesting that the environment of an undifferentiated tissue cell may lead to the production of adaptive enzymes which may function in tissue differentiation. Experiments investigating the possibility that cytoplasmic transfer of an adaptive enzyme might maintain the enzyme in the absence of the gene were negative, suggesting that the gene is essential for formation of the adaptive enzyme and consequently for tissue differentiation.

2118 Sarachek, A. & Fowler, G. L.
The induction by allyl glycine of heritable respiratory deficiency in *Saccharomyces* and its reversal by sulphur amino acids.
Canad. J. Microbiol. 1959 : **5** : 583–88.

Heritable respiratory deficiency was induced in cultures growing in the presence of allylglycine. The mutagenic activity of this cysteine antagonist was limited to cells which were unadapted to aerobic respiration and was suppressed by cysteine and to a lesser extent by homocysteine, methionine and α-amino-*n*-butyric acid. Its activity was enhanced by homoserine. It is concluded that genetic continuity of aerobic respiration in *Saccharomyces* depends upon a metabolic function in which cysteine participates. In cells not adapted to aerobic respiration that function is so limited that it can be disturbed selectively by growth in the presence of allylglycine.

2119 Nagai, S.
Induction of the respiration-deficient mutation in yeast by various synthetic dyes.
Science 1959 : **130** : 1188–89.

Acriflavine and several triphenylmethane and xanthene dyes were tested for capacity to induce petite mutants. The general trends detected in the relationship between chemical structure and mutagenic efficiency may be summarized as follows: (1) all the effective dyes were basic ones, (2) efficacy tended to be greater when the number of methyl groups in the molecule was higher, (3) the aminotriphenylmethane derivatives having methyl groups introduced into their amino groups were more effective than those having methyl groups introduced into the benzene configuration, and (4) the dyes which had ethyl instead of methyl groups were equal or superior in efficacy to dyes with methyl groups in the corresponding positions. The somewhat low efficacy of the Victoria blue dyes B and 4R as compared with other triphenylmethane dyes, in spite of its high absorption by the cells, may possibly have been due to the phenyl-α-naphthylamine moiety in the molecule.

2120 Medvedeva, G. A.
(Improving the biosynthesis of ergosterol in *Saccharomyces cerevisiae* yeast strain XII by means of radiomimetic compounds).
Mikrobiologija (Microbiology), Moskva 1959 : **28** : 175–78. [Russian].

Embichine [$CH_3N(CH_2.CH_2Cl)_2HCl$] induced mutagenic effects analogous to ionizing radiation except that the chemical had a stronger effect upon fermenting properties and a less inhibitory effect upon respiration. The production of ergosterol by the yeast strain was greatly improved.

2121 Kosikov, K. V. & Raevskaja, O. G.
(Inhibitory effect on directed mutational variability of enzymic properties).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **126** : 870–73. [Russian].

Experiments at the Institute of Genetics of the USSR Academy of Sciences showed that (1) a strain of *Saccharomyces globosus* cultured on sucrose acquired the capacity for fermenting this sugar and (2) directed changes were inhibited when the 34% sugar solution was altered by partial replacement of sucrose by maltose or lactose, particularly the former. The four-spored asci of the sexual progenies of cells with the acquired character segregated according to 2 : 2, 3 : 1 and 1 : 3 ratios in respect of the mutant and normal character.

2122 Necas, O.
Nuclear structure of growing naked protoplasts of yeasts.
Nature, Lond. 1959 : **184** : 1664–65.

Examined by means of phase microscopy and time-lapse cinematography, the nucleus in naked protoplasts and plasmatic formations of *Saccharomyces cerevisiae* contained a nucleolus and divided by simple elongation and subsequent constriction. Division of the nucleus was preceded by that of the nucleolus; the nuclear membrane did not disappear. A "nuclear vacuole" was not detected.

2123 Yuasa, A. & Lindegren, C. C.
The integrity of the centriole in *Saccharomyces*.
Leeuwenhoek ned. Tijdschr. 1959 : **25** : 73–87.

It is reported that haploid yeast contains a single centriole, the diploid two, the triploid three and the tetraploid four.

2124 Mundkur, B.
The fine structure of vesicular nuclei in frozen-dried *Saccharomyces*.
Genetics 1959 : **44** : p. 528. (Abst.).
According to the author's light-microscopic examination of frozen-dried preparations, the nuclei divided by elongation and median constriction without dissolution of the nuclear membrane. They were not differentiated into morphologically detectable chromosomes at any stage of division, the DNA being uniformly dispersed as particles throughout division. Interphase nuclei in a polyploid series exhibited progressive increments in volume from haploid to tetraploid, as expected. Electron micrographs of sectioned yeast were obtained after ultrarapid freezing and drying, followed by postfixation *in vacuo* with alcohol vapour, with or without heat denaturation of cellular protein. Various staining procedures were used. The nucleus was clearly differentiated, containing dispersed particles measuring about 250 Å.

2125 Karasevič, Ju. N.
(Adaptation of yeasts to pentoses. IV. Adaptation of *Torulopsis utilis* to arabinose).
Mikrobiologija (Microbiology), Moskva 1959 : **28** : 364–67. [Russian].
T. utilis strains did not become adapted to arabinose upon prolonged contact with this sugar. This is attributed to the absence in these yeasts of heritable systems for arabinose metabolism.

BOOK REVIEWS

2126 Jacob, K. T. (Editor).
Acharya Jagadish Chandra Bose birth centenary.
Trans. Bose Res. Inst. 1958 : **22** : Pp. xl + 230 : figs. : tables : plates.
The centenary of the birth of Jagadish Chandra Bose, founder and first director of the Bose Research Institute, Calcutta, fell on 30 November 1958. This special volume of the transactions of the institute has been published as a part of the programme of the celebrations. It opens with an account of Bose's physical and biophysical researches, which is contributed by D. M. Bose, the present director of the Institute. This is followed by a survey of the investigations carried out by the various departments of the institute, since its foundation in 1917. The activities of the Botany Department have included cytogenetical and breeding work, in which the well-known research on the induction of economically valuable mutants of jute, oilseed species and other crops by X and other radiations has been foremost. The greater part of the volume consists of 21 papers, most of which deal with biological topics of a particular or general nature. The articles are reports of original research or reviews. Some have been contributed by Indian scientists while the remainder come from investigators in other countries. Those likely to be of particular interest to readers of *Plant Breeding Abstracts* are abstracted below.

2127 *Müntzing, A. Accessory chromosomes. (pp. 1–15).*
Mainly with reference to plants, the author reviews information on accessory chromosomes, with reference to their distribution, possible ecological importance, genetical effects, mechanisms of numerical increase, somatic elimination, and origin and nature.

2128 *Curtis, H. J. Factors influencing radiation induced mutations in plants. (pp. 17–24).*
Based mainly on experience gained at the Brookhaven National Laboratory, Upton, New York, a discussion is given on the types of radiation which may be used for the induction of mutations, methods of producing and detecting these changes, and variables affecting the rate of mutation caused by X-ray and neutron treatments. In conclusion, it is emphasized that the problem now is not whether radiation can be used to produce mutations, but rather whether its use is economically feasible. The view is expressed that radiation probably has a two-fold part to play in crop improvement: (1) as a means of increasing variability when existing stocks show very little variability and (2) as a way of obtaining a single-gene characteristic in an otherwise satisfactory variety.

2129 *Bernal, J. D. Some reflections on structure and function in the evolution of life. (pp. 101–10).*
A brief review is given of the kind of biophysical considerations that are thought relevant in discussing the origin of life, special emphasis being laid on the hierarchic structure of organisms.

2130 *Pirie, N. W. The position of stereoisomerism in argument about the origins of life. (pp. 111–20).*

An attempt is made to explain the stereoisomeric uniformity of living organisms. The author favours the theory that uniformity has come about because of the selective advantage resulting from organisms being able to utilize stereoisomerically identical biochemical components of other organisms.

2131 *Oparin, A. I. Coacervate drops as the initial systems on the way to the origin of life. (pp. 121–25).*

Hydrolysis of RNA in coacervate drops by means of RNase and the passage of the hydrolysate into the equilibrium fluid has been demonstrated.

2132 CLIFTON, C. E. (Editor).
Annual review of microbiology. Vol. 12.
Annual Reviews, Inc., Palo Alto, California 1958 : $7.50 : Pp. vii + 581 : figs. : tables.

The twelfth issue [cf. XXVIII, 1085] begins with an editors' preface in which the motto is " 'It ain't necessarily so!' Today's concept may or may not become tomorrow's fact".

The first review is on Bacterial protoplasts, by C. Weibull; reference is made to the demonstration of nuclear bodies, cell walls and other structures in bacteria with the aid of the electron microscope and a full description is given of the means by which the cell wall may be removed and the protoplast studied. The properties of the cytoplasmic membrane in the free protoplast remain largely unchanged; protoplasts of *Echerichia coli* retain their ability to mate but no new types of genetic recombination have been observed when they do so. The action of penicillin is thought to consist in the inhibition of cell-wall formation.

In Bacterial viruses (with particular reference to adsorption/penetration), W. Weidel draws a general analogy between the infection mechanism of a phage and sexual processes. The different receptor mechanisms for phage in *Escherichia coli* are examined; they have been demonstrated in isolated cell walls, some in the inside and some in the outside layer. Studies of material extracted from mutants show that "the structural requirements which allow a phage particle to combine with its receptor are so exacting that the reaction fails even after changes at one of the participant surfaces too small to be detected with the most sensitive general method known for such purposes". The picture of the cell wall presented is that the inner layer, carrying the receptor sites for phages T3, T4 and T7, is buried under a layer of plastic lipoprotein, but in a way which leaves part of these sites exposed. Thus, the lipoprotein layer, which represents an ocean of T2-sites with considerably less sites for T6 admixed in the form of a separate lipoprotein component, has holes or rather discontinuities in it through which many of the potential sites for T3, T4, and T7 remain accessible. In addition to the holes, it is dotted with comparatively few, loosely bound particles of their own individual make-up, carrying the sites for T5. One of the first steps of infection is the formation of penetration holes by lysis of the cell wall, a process thought to be effected by the same enzyme as that which causes lysis of the cell itself after the phage has multiplied; in contrast to the receptor sites, the lytic enzyme is not type-specific. A certain scepticism is expressed as to how far DNA has been shown to be the sole carrier of what has been referred to as genetic information, the propriety of which expression is also questioned. Furthermore, the increasing number of difficulties being met in the application of the template principle are pointed out and the advantages of a sequential system are suggested: "the living cell is a dynamic system and should be able to read the news off a polynucleotide helix by removing from it the nucleotides bit by bit as they follow one another from end to end, without necessarily 'forgetting' about the sequence of those which were already removed. Some of the assumptions needed to make the DNA double-helix work as a template have become by themselves improbable enough, it would seem, to justify an effort to escape them altogether, if only by substituting new improbabilities for old ones. The field is not at all closed to a little exercise in free imagination". Some interesting observations are made concerning the degree to which recombinations in phage and in chromosome can really be paralleled but the cogency is lost by an unfortunate printer's error in line 8 of page 44.

In writing on Bacterial genetics, A. W. Ravin includes a certain number of results obtained with other organisms but deemed relevant to the subject. After reference to nonchromosomal mutations, the demonstration of gene linkage in various bacterial species is mentioned and this time the author finds no evidence that is in disharmony with the assumption that the genetic information of the cell nucleus resides in the DNA fraction. Several experiments with ultraviolet radiation are cited which indicate that the amount of nucleic acid precursors in the cell during exposure to irradiation is the important factor in mutation, rather than the amount of nucleic acid already formed prior to irradiation; and it seems likely that disturbance of nucleic acid synthesis is related to the mutational process, and that the formation of mutant genetic material is dependent upon concomitant protein synthesis. Mutation has been shown to be independent of cell division but not of metabolic rate. Back mutants are not all identical with the wild type but often inferior to it in efficiency. The results of experiments with labelled molecules are taken as excluding a dispersive or conservative type of reproduction and favouring a semiconservative system. Transformations effected with the DNA of another species are less frequent than intraspecific transformations, the frequency increasing with the degree of relationship of the species; double transformations have shown apparent linkage within the DNA molecule. Recent work on transduction and lysogenic conversion shows the increasing difficulty of drawing the borderline between bacterial and phage genetic material and between the effects of conjugation on the one hand and transduction and transformation on the other. Experiments are cited in which characters were transferred successively during conjugation, the order of transfer corresponding to the order on the chromosome map, and several cases are mentioned in which the order of particular loci is the same as that of the steps they govern in the chain of biochemical reactions. Many of the mutations recently described have been shown to involve altered structure of proteins and there is evidence that regions closely linked on the DNA molecule may determine various aspects of the specificity of a given enzyme protein or of a related group of proteins. Heterocaryosis has been observed in *Streptomyces* but not between species. Though conjugation between *Shigella* and *Escherichia* can occur, some characters seem not to be transferable and studies of such cases will, it is thought, throw light on the evolution of bacterial species.

H. E. Wheeler, writing on Genetics of fungi, cites some 160 out of 500 papers that have appeared on the subject. Several cases of gene conversion in organisms free from the peculiarities associated with yeast genetics are mentioned and various suggested explanations of its mechanism, all equally speculative, are examined. Complex loci and the concepts of muton, recon and cistron are discussed. Several reports refer to the formation of an enzyme by complementary gene action but it is pointed out that "no experimental test is available which can exclude the one-one hypothesis short of detailed knowledge of how genes act". It is further stated that "nearly all data obtained by tetrad analysis can be satisfactorily accounted for on the hypothesis of random crossing over with positive chromosomal interference". Genes and hormones controlling sexuality have been established in several further fungus species and the terms homocaryogamy and heterocaryogamy are proposed in place of homothallism and heterothallism. In reviewing the genetics of phytopathogens reference is made to findings which suggest that "the gene-for-gene hypothesis of the relationship between rust reaction in the host and pathogenicity in the parasite is an oversimplification". Reference is also made to the production of new rust biotypes by recombination in heterocaryons [cf. XXVII, 2101 and XXVIII, 330].

The volume also contains reviews on the metabolism of carbohydrates and related compounds, inorganic nitrogen metabolism, nutrition of microbes and of protozoa and algae, microbiology in the USSR, antibiotics in the control of plant diseases, masked virus infection in plants, the use of plant tissue cultures, the pathogenicity of staphylococci and the radiation preservation of food.

2133 Clifton, C. E. (Editor).
Annual review of microbiology. Vol. 13.
Annual Reviews, Inc., Palo Alto, California 1959 : $7.50 : Pp. vii + 553 : figs. : tables.

We have once more [cf. 2132] a number of contributions of interest to plant geneticists. P. E. Hartman and S. H. Goodgal, writing on Bacterial genetics (with particular reference to genetic transfer), review some 390 papers; a number of reports of transformation brought about by naked DNA are examined, some of them being found suspect however on the grounds of experimental technique. In general, interspecific transformations produce lower levels of transformations than specific transformations. More than one multiple transformation has been reported, suggesting the existence of distinct sites within a genetic locus. Phage-mediated transfer is exemplified by the genes for galactose utilization, which can be transduced by certain defective λ phage particles, and general transduction, where larger sections of the genome, or possibly even the whole genome, are involved. What was previously called lysogenic conversion has been shown not to depend on reduction of the phage genome to prophage and is now referred to therefore as phage conversion. The phage may alter the antigen production of the host, its toxigenicity, or other properties. It is considered however that in many cases "re-analysis is required in order to differentiate between mutation-selection phenomena and alterations induced by phage-carried genetic material". Many puzzling phenomena associated with "sexual recombination" on conjugation have been explained by the discovery that transfer generally occurs in one direction only, a portion only of the haploid complement being transferred; the transfer is moreover sequential, so that the linear arrangement of the genetic determiners along the transferred fragment (of DNA?) may be followed; what emerges however, when the entire chromosome is mapped, is a circular sequence. Only part of the genetic material seems to be transferable in interspecific conjugations. Bacteriocins, that is substances that kill bacteria, the colicins being the first to be discovered, are said to be "polypeptide or protein molecules, often weakly antigenic, which, when adsorbed to specific receptors on sensitive bacteria, kill the cell". They seem to be related in some way to certain carried phages, and some of them share a common receptor with a phage. The general conclusion of the reviewer is that "it is highly likely that cell-to-cell transfer of genetic materials occurs frequently in mixed populations of bacteria in nature"; that the present classification of bacteria but little reflects the actual evolutionary status and relationships between species; that "perhaps it would be best to let taxonomy rest for awhile until a truly knowledgeable solution is formulated, which can stand the test of time"; "even some of the newer hopes of the taxonomist, for example, the chemical analysis of the insoluble and nondigestable residues of bacterial cell walls, will not offer much of a solution except in extreme ranges"; and data on DNA composition "offer a theoretically pleasing approach but fail in their sensitivity to discern small differences in base ratios".

M. Demerec and P. E. Hartman write on Complex loci in micro-organisms, starting with a review of the evidence for the existence of complex loci in *Neurospora* and other fungi, in bacteria and in phages, leading to the conclusion that nonidentical allelism (complex structure of loci) is not a special feature of certain gene loci but a general property of all. In *Salmonella*, and presumably in bacteria generally, there are marked tendencies for genes controlling related reactions to be located next to one another and to be arranged in the same order as the sequence of their biosynthetic blocks. Thus 31 sites have been identified in the *his* B locus, which controls imidazoleglycerol phosphate ester dehydrase, and 33 in *his* C, which controls imidazoleacetol phosphate ester transaminase; within the locus the sites can be arranged in groups. Allelic mutants may differ in mutability, nutritional requirements, degree of enzyme activity and other features. Cases are known in which complementation occurs between sites that control the same enzyme. Adjacent loci controlling biochemical sequences are cited for the tryptophane series, the serine, threonine, isoleucine, valine series and the proline series. The whole body of data reviewed is thought to be consistent with the view that a site is represented in the DNA molecule by either one or a few nucleotide pairs.

Recombination in bacteriophage is dealt with by C. Bresch; the process is, we are told, more complex than in higher organisms, in view of: the occurrence of triparental recombinants; the increase in number of recombinants with the time taken for lysis to occur; and recombination being not distributed at random but several events seeming to be correlated, leading to what is known as negative interference. Various attempts to analyse these events in terms of population genetics are examined. It would seem that most of the experiments so far performed are susceptible of two or more different interpretations and unambiguous formulations are seen as a thing of the future.

Biochemical cytology of microorganisms is reviewed by P. Mitchell, who points out the identity in size range between most bacterial cells and mitochondria; the main subcellular organelles are described and data on their composition are reviewed, particular attention being paid to the distribution of enzymes. Under the heading physiology, information connected with transport phenomena and other metabolic functions is reviewed. It is suggested that mutations, aminoacid sequence and protein composition may be of two types: those causing change of catalytic activity by changes in the active centre region of the aminoacid sequence; and those causing a change of location of the catalytically active protein in the cell by changes elsewhere in the polypeptide chain. Hence, "we may conceive in similar terms the mechanism whereby bacteria may have evolved not only their chemical repertoire in terms of the individual catalytic activities of their constituent enzymes, but also the complex spatial organisation of their components which is responsible for the directiveness of their assimilatory and synthetic activities, and for the generation of the cell as we see it."

In a contribution on Plant disease resistance, H. L. Barnett expresses wonder at "how much has been written about so few well-established facts". The main forms of parasitism are outlined, resistance regarded as "the result of all of the factors which tend to prevent or reduce the aggressive or pathogenic activities of the parasite after contact with a potential host has been made". These factors are considered under two heads, those preventing penetration and those operating after penetration; in the latter group both structural and chemical factors are examined; in certain cases a growth substance has been found to be operative in determining host-parasite relationships, in others an oxidase system, polyphenolases and other enzymes, polyphenols, or various unidentified "antibiotic substances".

There are also reviews on microbiological aspects of tissue culture and a number of other topics more directly concerned with pathology.

2134 ZIMMERMANN, W.
Die Phylogenie der Pflanzen. (**The phylogeny of plants.**)
Gustav Fischer Verlag, Stuttgart 1959: 2nd Ed. : DM 118 : Pp. xxiv + 777 : 331 figs.

The first edition of this massive work appeared as long ago as 1930. The present edition, so extensively rewritten as almost to constitute a new book, provides an excellent and thorough survey of plant morphology, with special emphasis on fossil forms.

The introductory sections deal with the significance of taxonomic and morphological categories, including a brief examination of the status of "idealistic" morphological notions. These are followed by an account of theories on the origin of life, much expanded in comparison with the earlier edition in view of the spate of recent work on this topic, largely inspired by Oparin. Most of the book is taken up with detailed morphological accounts of the entire range of fossil and existing orders of plants. Not much is said about the bacteria, Cyanophyceae, higher algae, fungi or Bryophyta, but the Pteridophyta and higher plants receive exhaustive attention. Among the principal changes in this edition are the removal of the Asteroxylaceae and Psilotales from the Psilophyta, the treatment of *Noeggerathia* and some putative related forms as a separate phylum, the considerable additions to the ferns and pteridosperms and the addition of the recently discovered Pentoxylales to the Cycadopsida.

The morphological part of the book is followed by a survey of the geological history of the various floras, the author coming out in favour of Wegener's theory of continental drift.

The final chapters are somewhat miscellaneous and deal with various theoretical problems such as the significance of homology and, rather perfunctorily, evolutionary tempo.

Regarded as an advanced botanical text book, this beautifully produced volume has much to commend it. Whether, however, it fulfils the aim of the author in dealing with the phylogeny of plants is another matter. At the end of each major taxon, the author attempts to derive what conclusions he can from comparative morphology and the nature of the fossil record as to the origins of the taxon and the course of evolution within it, but in general, and as would be expected, with little success. Liberally sprinkled over the pages are a number of evolutionary trees—seaweed provides a better visual impression—but perusal of the text soon shows that these are excursions into the realms of remote hypothesis.

One feature of the present edition is the author's use of the concept of hologeny, that is phylogeny involving all stages in ontogeny and not just the end products, and his illustrating this by means of a spiral projection. In some ways this does assist the reader in grasping the nature of evolutionary change, but misunderstanding is liable to arise, in spite of the author's reservations, when the hologeny of the angiosperm megasporophyll is seen proceding via *Aconitum* → *Acer* → *Clematis* → *Pulsatilla*.

Cytogenetics, which most readers of *Plant Breeding Abstracts* would regard as of paramount importance in understanding plant phylogeny, is barely mentioned, the allusions being practically confined to the introductory chapters, the final remarks and the section on the angiosperm flower. There are a few genera, such as *Gossypium*, where a combination of morphological, historical, cytological and genetical approaches has thrown genuine light on a particular phylogeny. To the less theoretically inclined, such down-to-earth studies are more appealing than the highly hypothetical elucidation of the affinities of angiosperm taxa which our author provides on pp. 610–14.

2135 HUNTER DUPREE, A.
Asa Gray, 1810–1888.
Harvard University Press, Cambridge, Massachusetts and Oxford University Press, London 1959 : 60s. : Pp. xi + 505 : plates.

Many biologists today are familiar with the name of Asa Gray through the writings of Charles Darwin, and the appearance of his biography in the centenary year will appear most appropriate. We are told of his early reading—Sir Walter Scott and less august works such as Mrs. Ross's *The bachelor and the married man, or the equilibrium of the balance of comfort*; we are given a picture of the scientific atmosphere of the early nineteenth century: owing to increasing specialization Asa Gray confined his studies to chemistry, mineralogy and botany! After becoming a Doctor of Medicine at the age of twenty, his friends thought he could "pursue the sciences alongside his proper business as a doctor, and perhaps later he could teach". And that is what he did. He was later however to be appointed to the first chair devoted exclusively to botany in any American educational institution. Owing to failure of the emoluments he later transferred to Harvard. Together with John Torrey he edited the *Flora of North America*. His tour of Europe gives a picture of the oppulent scientific circles of the early nineteenth century in Britain and the European continent, where meetings took place with such personalities as the Hookers, Augustin and Alphonse de Candolle and a certain "Mr. Darwin, the naturalist who accompanied Captain King [*sic*] in the Beagle". In the account of his years at Harvard we get a glimpse of the sectarian parochialism of provincial Massachusetts and what is described as "the prevailing puerility of the institution". We read, in spite of his first misgivings about the fixity of species, of his defence of the principle of special creation, his initial espousal of Agassiz and then, after a decade of work on plant collections and other multifarious activities, of his having lunch one day at Kew with Dr. Hooker, when he met "a lively, agreeable person", Charles Darwin. The reason why Gray never produced any really great discoveries like those of Darwin, Newton or Mendel is ascribed to "the multiplicity of duties which Americans heaped upon anyone who had proved his eminence at research". His approach was pragmatic and he came to reject the transcendentalism of Agassiz, agreeing more with Joseph Hooker's ideas on the distribution of species. It was this apparently that appealed to Darwin, who showered him with pregnant questions and in a letter dated July 20th, 1857, gave him probably as elegant a summary of his *Origin of species* as has been written before or since; a more detailed outline was to follow. The data from Gray's study of the flora of Japan fitted well with Darwin's principles, showing a number of species with areas shared between eastern Asia and eastern America; other species were closely related and suggested derivation from a common stock; his views were presented to the Cambridge Scientific Club at Harvard on 10 December, 1958, and to the American Academy of Arts and Sciences on 11th January, 1859, and in April of that year he gave his support, though still qualified, for Darwin's view. The only one of the hearers to react strongly was apparently Agassiz, who is reported as saying "Gray, we must stop this". Americans, we are told, were more stirred by John Brown's raid!

We are given a full account of the pencil notes on Gray's copy of *The Origin*, which he read at Christmas, 1859. Concerning Darwin's explanation of the origin of variation he wrote "and so it comes to Lamark, after all!" The general impression of the account is that he gained less satisfaction from the light the book threw on the truth of the matter than from the discomfiture of Agassiz. Nevertheless in the years that followed he did noble battle for the Darwinian principle, though continuing to entertain doubts as to the "heritability of acquired habits and aptitudes" and the absence of design: "streams flowing over a sloping plain (here the counterpart of natural selection) may have worn their actual channels as they flowed; yet their particular courses may have been assigned". His pamphlet representing these views, though never published in America, was widely read in Europe; the design principle was however not accepted by Darwin. The scientific battle was suddenly overshadowed by a real one in the form of the Civil War and after that by a series of local political crises, but when Gray met Darwin again in 1869 he found "that Darwinism had come close to merging with materialism and the philosophy of Herbert Spencer", and, together with Lyell, he stood aside, though he continued to collaborate with Darwin on purely botanical subjects such as insectivorous plants, coiling of tendrils and self fertilization, and to defend Darwinism from the charge of atheism.

On perusing these pages we come to recognize that Asa Gray's great contribution to Darwinism was in attempting to steer it on a middle course between the excesses of both its partisans and its critics in America; not however with unmitigated success. He continued to express uncertainty as to the mechanism of variation and in this is held by the author to have anticipated the geneticists of the twentieth century.

Most of his latter years were taken up with classifying large collections of plants, and not a little time apparently with controversy concerning Latin names. They did, however, include invitations to such places as Lambeth Palace and a conversation with Mr. Gladstone consisting of "pleasant talk, of nothing in particular".

2136 WADDINGTON, C. H.
Biological organisation. Cellular and sub-cellular.
Pergamon Press, London 1959 : 70s. :
Pp. xviii + 328 : figs. : tables.

At the Ninth General Conference of the United Nations Educational, Scientific and Cultural Organization (UNESCO), held at New Delhi in 1956, it was decided to organise a Cell Biology Symposium. It was agreed that the topic of the symposium should be "Patterns of Cellular and Sub-cellular Organization". The proceedings of the symposium, which took place on 6–10 September 1957, are now presented, since, as the editor points out, "the problems which we discussed are among the most important in biology, and although it is obvious that no final answers could be given to them, it is hoped that other biologists will find something of interest in the views expressed".

The volume starts with a useful outline, by C. H. Waddington, of the problems that should be discussed. After this there were no set papers and the text comprises a record of the discussions at the respective sessions. The first was concerned with the nature of biological organization; speakers first attempted to define what is meant by organization and then an attempt was made to distinguish between ordered arrangements that result from the inherent properties of bodies—molecules, organelles, cells—when they occur in groups, and those that may be imposed on them by a so-called organizer. The second session discussed organization at the gene level; G. Pontecorvo, in opening the discussion, took the view that genes can now be envisaged as "units of function arising from an aperiodic sequence of structural elements"; that crossing over can occur between parts of genes as well as between genes; and that certain "areas" of one gene may overlap with certain areas of another. In reply to a series of piercing questions as to the nature of these arrangements and what was meant now by a gene, the response was "Yes, function, that's the only definition we are left with". S. Brenner suggested that "DNA has no other function at all except to transfer information to protein, and specifically to transfer information to enzymes". All protein molecules so far studied consist of unbranched polypeptide chains, there being 20 different aminoacids in the chain for protein, four in that for DNA; when the chain is folded in the molecule, certain aminoacids come together and may form action "centres"; a change of one aminoacid may produce a defective protein or even result in its complete absence. In bacteria the genetic material is supposed to consist of a long strand of DNA; in almost all other organisms it is organized into chromosomes. The problem of coding was, rather inconclusively, discussed.

The third session dealt with the organization of the chromosome. H. G. Callan described the fine structure as seen in lampbrush chromosomes, some of them showing what were referred to as allelic differences. More than one speaker expressed the view that the chromosome in higher organisms comprises a single DNA strand, just as recent work "suggests that you could isolate all the DNA of a bacterium as one piece, and that you can't separate the genetic markers by ion-exchange chromotography unless the DNA has been fragmented by the preparation". W. Beermann and others described differences in structure in the same chromosome band in different organs, thought to be connected with metabolic activity in a given genetic locus; C. Pavan demonstrated the same thing and also showed a differential increase of DNA in different parts of the chromosome; he suggested that the increase might be in amount of DNA or in DNA activity or in both, though other speakers seemed unwilling to accept this interpretation.

Functional interactions of nucleus and cytoplasm were discussed in the fourth session. Waddington showed that in the uptake of aminoacids the nucleus and nucleoli are particularly active in the early stages of development but later on there is more activity in the cytoplasm. Beermann described species of *Chironomus*, and even mutants, with differing numbers of nucleolar organizers; W. Plaut showed that *Acetabularia* and *Amoeba* are capable of synthesizing RNA and protein without the presence of the nucleus, though RNA from the nucleus seems to be necessary to start the process.

The fifth session was devoted to morphological organization of nucleus and cytoplasm. H. Gay showed electron micrographs deemed to support the multistrand structure of the chromosome, the number of strands apparently varying with the functional state of the organ; heterochromatin is thought to be involved in protein synthesis and in the transfer of material from the nucleus to the cytoplasm, so called blebs in the nuclear membrane being in some way involved. F. S. Sjöstrand showed electron micrographs of various cell membranes, all of which seem to exclude the possibility of the existence of holes in the nuclear membrane; preparations made by freeze-drying suggest that osmium-fixed material does not give a true picture of the structure of the cytoplasm. Microsomes were recognized as artifacts though it was agreed that they have a real existence as far as function is concerned, which may, it was suggested, reside entirely in their surface properties.

Activities of the cytoplasm were discussed next. G. H. Beale described the cytoplasmic particles in *Paramecium* that determine the antigen and the killer systems, in both of which there is a mutual interaction between genes and cytoplasm; H. Holtzer gave details of protein differentiation in myoblasts of chick embryos; and J. Gustafson spoke about the relations between development and mitochondria in the sea-urchin egg. The next session was on the chemical organization of the cell as a chemical kinetic system. Waddington, in outlining a kinetic theory of development, referred to genetic variability in the resistance of organisms to change and the possibility that the gene content of a cell might change in the course of development. A. C. R. Dean outlined "a kinetic scheme whereby bacterial adaptations may take place as an automatic adjustment in response to the environment". The changes are reversible but reasons are given why the reversibility may be extremely slow. P. Weiss presented a new mathematical formulation for the kinetics of growth, involving a system of feed-back circuits, which explains some of the oscillating systems often observed in nature. M. R. Pollock spoke on the phenomenon of enzyme induction, making it clear that in all cases where it has been carefully looked for, traces of the enzyme concerned can be detected before the inducer is added. There were sessions on embryonic induction and on the organization of tissues into organs and a final session on cell division. M. Mitchison mentioned evidence that cleavage can occur in sea-urchin eggs without "the mitotic apparatus inside them", and recapitulated his hypothesis that cleavage occurs as a result of expansion. F. E. Lehmann pointed to differences between animal and plant cells in their response to colchicine. R. Dan supported the role of asters and spindle in the process of cell division, organization within the cell being seen as "an inflow- and outflow-circulation of materials, the raw material being transported from the cytoplasm towards the astral centre and the finished product (astral ray) being pushed out from the centre towards the periphery". The members were unable to agree as to whether DNA increase is linear or exponential. In the last few minutes of the discussion it was stated that there is no experimental evidence that DNA makes RNA. In fact it is impossible to read these pages without being impressed by the immense number of problems about which the experts in one of the fundamental fields of biological research are prepared to confess their total ignorance.

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Enzymes. Lectures held at the conference on enzymes and their action, Wageningen April 6–9, 1959.

N.V. Uitgevers-Maatschappij W. E. J. Tjeenk Willink, Zwolle 1959 : f. 9 : Pp. 158 : figs. : tables.

An international conference on "enzymes and their action" was held in Wageningen on April 6–9, 1959. The seven articles in this volume represent the papers given at this conference, which was the second one in a series of conferences on fundamental subjects in the field of the exact sciences. The first contribution was an historical introduction by E. C. Slater, who gave some useful information on what enzymes are, what they do, how they work, and some of their uses. Other speakers dealt with intracellular localization of enzymes, structure and mode of action of proteolytic enzymes, inhibitors of enzymes, regulation of enzymic reactions within the cell, and biosynthesis of enzymes. The last subject, dealt with by H. Chantrenne, included an account of the chemistry of flower pigments and its genetic structure and of the biochemical mutants in *Neurospora crassa* and other microorganisms, all of which are taken as upholding the one gene - one enzyme hypothesis. Data on induced enzyme formation are mentioned which show that the enzyme had been formed completely from the free aminoacids of the new medium as a result of induction. It is pointed out however that the capacities to adapt to a certain external stimulus and to make a certain enzyme are inherited as Mendelian characters. Mutation may cause a slight change in the fine structure of the protein produced, such that the enzymatic properties are changed or suppressed, without the serological or other properties of the protein being notably altered. Genetic studies of hemoglobin show that a mutation may affect the assortment and arrangement of aminoacids in the polypeptides. Some results are cited which suggest that a constitutive strain of *Escherichia* *coli* contains all that is necessary for making a certain enzyme and the corresponding adaptive mutant contains something over and above this which inhibits enzyme formation [cf. XXIX, 46]. The transforming ability of DNA is taken as proof that it is the genetic material responsible for the synthesis of the individual enzymes and proteins, and it is assumed that a given arrangement of the nucleotides in the DNA strictly determines the sequence of aminoacids in the corresponding protein. The fact that proteins and enzymes can be synthesized in enucleate cells shows however that the control exerted by DNA is indirect, RNA and ATP being regarded as probable intermediaries.

2138 Ruhland, W. (Editor).
Handbuch der Pflanzenphysiologie. Band 11. (**Encyclopedia of plant physiology. Volume 11.**)
Springer-Verlag, Berlin 1959 : DM 248 : Pp. xxv + 1033 : figs. : tables.

The eleventh volume of the series [cf. XXIX, 3306] is devoted to heterotrophy; in an historical preface, K. Mothes points to the important contribution of the study of biochemical mutants towards an understanding of basic metabolic processes and the first chapter is for this reason devoted to the use of mutants in the study of metabolism, by H. J. Vogel and D. M. Bonner; this starts with the now classical work of Beadle and Tatum on mutants showing increased nutritional requirements in *Neurospora crassa*. The techniques employed and the principles involved are explained and are illustrated by a number of concrete examples. In some of the syntheses different pathways have been detected in different organisms, as in the case of ornithine synthesis in *Escherichia coli*, which differs from that established for *N. crassa* and mammals; other instances of such differences have been found in the synthesis of diaminopimelic acid, lysine, and niacin in *N. crassa* and *E. coli*; many types of synthesis, such as the formation of valine and isoleucine, the formation of aromatic acids via shikimic acid and many others analysed, seem however to take place by the same steps in different organisms. In a great number of cases the synthetic pathway as established by studies on mutants corresponds to that deduced from experiments with tracers and with enzymes, and in many instances the mutants have provided additional information. By far the greater portion of these studies has been carried out on the synthesis of aminoacids and vitamins but mention is also made of contributions made by biochemical genetics to an understanding of the synthesis of purines and pyrimidines, various pigments and bioluminescent substances, and of the metabolism of acetate, ammonium salts, nitrates, sulphates and hydrogen.

Chapter IV, on Physiologisch-chemische Fragen der Heterotrophie [Questions of chemical physiology in heterotrophy], contains a section by H. J. Vogel on Induction and repression of enzyme formation, a phenomenon said to be widespread if not ubiquitous among living cells. The potentiality for induced enzyme formation is a heritable property of a cell population. This property can generally be modified or lost through sporadically occurring mutations. For instance, the ability of *E. coli* to form an inducible enzyme, β-galactosidase, can be lost through mutations which may arise spontaneously or at increased frequency after treatment with physical or chemical mutagens. Mutations are also known that enable the organism to produce an enzyme without the provision of the usual inducers. The repression of a given enzyme is also under genetic control. Views on the mechanisms of induction and repression are reviewed, the regulator hypothesis being found to be most in harmony with experimental findings. Further chapters deal with the biology of heterotrophs, including various forms of symbiosis; microbiology of natural substrates; the properties of humus; and the importance of heterotrophs for the nitrogen and mineral cycles.

2139 Steward, F. C. (Editor).
Plant physiology. A treatise. Volume 2. Plants in relation to water and solutes.
Academic Press, New York and London 1959 : $22.00 : Pp. v + 758 : figs. : tables.

This treatise is to be comprised of six volumes in all, the second of which has now appeared; it is designed for the use of advanced and postgraduate students, teachers, research workers, and investigators in other fields of knowledge who need information about the present status of plant physiology. Each chapter is, according to the modern practice, contributed by a different authority. The first chapter deals with Cell membranes: their resistance to penetration and their capacity for transport. It is shown that most, if not all, of the permeability theories proposed later may be regarded as special cases of the all-embracing theory of Pfeffer. While the details of the plasma-membrance structure are still more or less hypothetical, the more gross features of their structure are now fairly well agreed upon. The system favoured is that propounded by Bungenberg de Jong, according to which the plasma membranes consist essentially of phosphatide double films which contain certain amounts of such substances as cholesterol and phosphatidic acid. The molecules of such a membrane will be in incessant thermic agitation. This will give rise to the appearance of smaller and larger holes between the carbon chains of the lipids. So it will be understood that such a membrane will act as a filter and as a selective solvent at the same time.

The second and third chapters deal with the relations of plant cells to water, the next two to inorganic and organic solutes respectively, the sixth with translocation of inorganic solutes. The last chapter, on transpiration and water economy, contains a section on drought effects and drought resistance. As regards the mechanism of drought resistance there is, we read, at present a tendency toward a viewpoint which admits that numerous factors are involved, including those which postpone dehydration as well as those which increase ability to endure dehydration. Various degrees of resistance are defined and some structural characteristics which favour drought resistance are enumerated; among those leaf structure is particularly emphasized; a thick layer of cutin which retards cuticular transpiration combined with stomata which close promptly when leaf moisture begins to decrease can greatly reduce water loss and prolong survival. In the last resort however it is the ability of the protoplasm to endure dehydration that is the decisive factor in determining survival; this ability differs in different species and even shows seasonal variations; the nature of these variations remains a subject for further study.

2140 Curtis, J. T.
The vegetation of Wisconsin.
University of Wisconsin Press, Madison 1959 : $7.50 : Pp. ix + 657 : figs. : tables : 66 plates.

Every science in the course of its history passes from the largely qualitative to the almost entirely quantitative approach and plant ecology, which has for some years been in a transitional stage, is no exception. Professor Curtis is one of the pioneers of quantitative analysis of plant communities and he and his associates at the Plant Ecology Laboratory of the University of Wisconsin have for the past two decades been engaged in collecting extensive data on the vegetation of Wisconsin and in devising suitable methods of analysing them. Professor Curtis's aim in the present volume is to summarize the results of these investigations and to integrate them with those of other workers.

The first part of the book comprises chapters on the flora, the environmental factors and the types of plant community occurring in Wisconsin, together with a small but important chapter on the methods of study employed, namely, the sampling techniques and the determination of such values as species density, presence value, homogeneity indices and indices of similarity.

The next five parts deal in turn with the southern forests, the northern forests, grasslands, savannah and shrub communities, and lesser communities. For each community the general distribution, composition, environment, geographical relations and utilization are described, and details of life histories of dominant species are given.

Part 7 is concerned with the vegetation as a whole and has three chapters, the first on post-glacial history, the second on the effect of man on the vegetation and the third on interrelations of communities. Most of the preceding chapters are mainly descriptive, many of the tabulated data and maps for each chapter being placed in appendices at the end of the book. The last chapter, however, gives an analysis of community structure and includes graphical representations illustrating the relations between community, environmental factors and life forms and showing the behaviour of individual species within the entire vegetational range.

It is hardly to be supposed that quantitative analysis of ecological data in itself would lead to any new or startling deductions, and indeed Professor Curtis draws only the following two conclusions: that within any community, stand-to-stand variation is continuous, distant stands being more different from each other than stands lying close together; and that each species behaves as an individual and not as a member of a coherent biological group. This is summed up in H. A. Gleason's words: "An association is not an organism, scarcely even a vegetational unit, but merely a coincidence". These are not new ideas but it is as well that plant ecologists should be reminded of them and be aware that they rest on firm methodological foundations.

The book itself is well produced, with many fine photographic plates, a glossary, an extensive bibliography, a species list and an index, as well as the chapter appendices mentioned above.

There are two points at which improvement is possible. Firstly, typographical errors seem unnecessarily frequent, proper names in particular often being wrongly spelt; the name Raunkiaer, for example, appears several times as Raunkaier. Secondly, since the number of tables and figures in the main text is rather small, and the cross references to them give no page number, it is necessary either to hunt through many pages or to consult the list of contents each time before the required page is found.

2141 NORMAN, A. G. (Editor).
Advances in agronomy. Volume 11.
Academic Press, New York & London
1959 : $12.00 : x + 428 : figs. : tables.

The first contribution in this issue [cf. XXIX, 2114], dealing with water and its relation to soils and crops, is a new departure in that it is compiled by a group of authors under the sponsorship of a committee of the Agricultural Board of the National Academy of Sciences; it occupies about a quarter of the volume. Other contributions deal with the economics of fertilizer use in crop production, developments in agricultural machinery, fertilizer production and technology, land use in the Netherlands, and the effect of nitrogen on the availability of soil and fertilizer phosphorus to plants.

2142
The world of learning 1959–60.
Europa Publications Ltd., London 1960 :
10th Ed. : £7 : Pp. xiii + 1221.

The compilers of this guide, to which readers of *Plant Breeding Abstracts* will need no introduction, remain undaunted by the formidable task they have undertaken [cf. XXIX, 2113]. Following the arrangement of its predecessors, the tenth edition bravely keeps pace with the newly established institutions in various countries and the changes which have affected the old ones, and, compared with the previous edition, has increased in thickness by about 100 pages.

2143 BURNET, F. M. & STANLEY, W. M.
The viruses: biochemical, biological, and biophysical properties. Volume 1. General virology.
Academic Press, New York and London.
1959 : $16.50 or £5 18s. : Pp. xvii + 609 : figs. : tables.

The first volume of this work, which appears shortly after the second [cf. 950], is entitled General Virology and starts with the editors' preface, in which mention is made of those "who are more impressed with the mounting difficulties of applying the methodology of chemistry to the complex macromolecules of living systems and their interactions than with the inevitability of their being overcome," and to the special value of the viruses as experimental material for such studies. They also contribute the first review, on The problems of virology; all viruses, we are told, contain nucleic acid and protein and the smaller animal and plant viruses apparently contain little or nothing else. The nucleic acids are "the essential elements in the sense of being the carriers of the genetic codes by which new virus is reconstructed"; and the new concept of infectious nucleic acid seems destined to become one of great importance for further research. Significant differences in the bases have already been found in the RNA of different strains of the influenza virus and differences in structure of the nucleic acids in strains of tobacco-mosaic virus. The larger viruses are regarded as more equivalent to primitive organisms and hence are less susceptible of a chemical approach.

The second contribution, covering well over 200 pages, is on Structural and chemical architecture of host cells with special reference to the synthesis of polymers, by S. S. Cohen, one of the problems discussed being whether viruses contain the enzymes required for the synthesis of their own polymers and are hence truly self reproducing; the extent to which viruses may be regarded as "abberrant [*sic*] cellular particulates" is also considered. The object of the review is to provide the biochemical framework on which the modern virologist should develop his data, and a survey is given of the recent data that have accumulated on the structure, distribution, interactions and biosynthesis of the three crucial cell constituents DNA, RNA and proteins. The mysteries of virus multiplication present an admirable opportunity for the study of polymer biosynthesis and workers in cellular biochemistry and in virology are urged to come together in the study of what have already been shown to be common problems. The formation of peptide bonds through the intermediary development of high-energy bonds in compounds such as ATP is taken as the basis of polymer biosynthesis and the various types of reaction are explained, as is also the structure of the nucleic acids; both RNA and DNA are recognized as heterogeneous physically, chemically and also biologically; the amount of nucleic acid in a virus is from 25 to 500 times less than that in a bacterium, which confers a considerable advantage on the virus as a research object. Both viral DNA and RNA can be infectious and in infected cells cause the synthesis of viral nucleic acid and viral protein. The Watson-Crick and other similar models for DNA duplication are examined but it is pointed out that little or no experimental evidence exists as yet in support of them.

The next contribution is on The physical properties of infective particles, by H. K. Schachman and R. C. Williams; we are told that virus particles are composed mainly of nucleoprotein and their size range is between 200 and 300Å.; the spatial arrangements of the protein and nucleic acid in the macromolecule are however largely unknown. The most that can be stated definitely seems to be that in suspension the particle is frequently spherical or nearly so and that within it there are polypeptide chains and nucleic acid polymers, presumably in some regular spatial array; the central region of the particle seems to be filled only with fluid, which contains various ions, the surface being irregular and having many charge groupings. Outside the particle as a whole there is an ionic atmosphere that is radially nonuniform, extending for a distance perhaps as large as the radius of the particle and depending upon the ionic strength of the solution. The main part of the review is taken up with a description of the various methods whereby the properties of the particles can now be studied. The main properties of some of the best studied viruses are then described, the first being very naturally tobacco-mosaic virus, the molecular weight of which is calculated approximately as 4×10^7 g./mol; the length as 3000Å., the diameter 150–160Å., the protein moiety having a helical structure; the exact geometry of the association of the RNA polynucleotides with this helix apparently still remains uncertain. From the structural point of view all strains of native virus examined appear essentially identical except for differences in the heights of the scattering peaks in the radial distribution plots. The tomato bushy stunt virus has a molecular weight of the order of 9×10^6 and is spherical, the RNA apparently comprising the central core. Turnip yellow mosaic virus seems to comprise two constituents, one being pure protein and the other a mixture of protein and RNA, the RNA when isolated having been proved infectious. Animal viruses have been less intensively studied than plant viruses and data are presented only for poliovirus.

Chapter 4, by C. E. Schwerdt, is on Quantitative relationships between virus particles and their functional activity; various methods of assay are described; discrepancies examined are not considered sufficient to invalidate the assumption that one virus particle is capable of initiating infection. Inactivation of viruses is reviewed by S. Gard and O. Maaløe, the latter dealing with physical and physicochemical, the former with chemical agents. H. Fraenkel-Conrat writes on The chemical basis of the infectivity of tobacco mosaic virus and other plant viruses; it is stated that all known plant viruses contain only RNA while animal and bacterial viruses may contain either RNA or DNA, it being suggested that the RNA viruses may have a separate evolutionary history from the others and be possibly the older. In all cases studied the protein furnishes the outer shell and the nucleic acid is located internally. Descriptions are given of the techniques for isolating viruses and for degrading tobacco mosaic virus into its nucleic acid and protein fractions; the latter is in shape and form almost indistinguishable from the intact virus. We are told how the nucleic acid fraction when added to a suitable amount of the protein fraction can be reconstituted into infective virus, and the reconstituted product, illustrated by an electron micrograph, is also said to be almost indistinguishable from intact TMV. The protein moiety alone is not infective; the nucleic acid is inactivated by ribonuclease in low concentrations and ultraviolet radiation and certain other agencies; it possesses the capacity for infection, though to a lesser degree than the virus reconstituted from it. Certain other viruses from which infective RNA has been isolated are also referred to. Virus reconstituted from the RNA of one strain and the protein of another resembles the strain supplying the RNA in infective properties but the degree to which the RNA impresses its properties upon the "foreign" protein coat is still under investigation. When RNA from different strains was mixed before reconstituting, the infectivity of the resulting virus was impaired, implying that subunits of different RNA strains had been incorporated; no conclusive evidence of the production of virus strains of mixed or intermediate character however has yet been obtained.

E. A. Evans Jr. writes on The comparative chemistry of infective virus particles and their functional activity: T2 and other bacterial viruses; the nucleic acid of most T coliphages is now accepted as being comprised exclusively of DNA, though T7 and possibly T3 constitute an exception. Their structure is described and information on the aminoacid composition of their proteins summarized. Evidence is presented for the existence of five protein fractions, viz. (1) the protein sheath of the head, (2) a protein of the proximal portion of the tail, having possible contractile functions in viral invasion (and differing from 3), (3) a protein of the proximal portion of the tail, possessing lytic activity for bacterial cell walls, (4) the protein of the distal portion of the tail, serving as the agent for the initial attachment of the virus to the bacterial host and (5) the protein of the so-called "core structure" of the tail of the viral particle. The nucleic acid of the even-numbered coliphages and T16 is unique in possessing 5-hydroxymethyl cytosine, which has not been found in any other naturally occurring material; the amount of glucose varies with the strain.

W. Schäfer writes on The comparative chemistry of infective virus particles and of other virus-specific products: animal viruses, G. H. Bergold on Biochemistry of insect viruses, and F. M. Burnet on The scope and limitations of immunological methods in the characterization and functional study of viruses. Finally in The reproduction of viruses: a comparative survey, S. E. Luria presents the thesis that "virus multiplication as a biological process belongs on the level of the replication of subcellar elements, that is, on the level of cell growth rather than of cell multiplication". The virus contributes to the cell a set of genetic elements which initiate and determine the new biosynthetic pattern. The replication of the genetic material of host and virus may be almost completely integrated, as in the prophage of temperate phages in lysogenic bacteria, and there is a full range from this to complete incompatibility, as with the intemperate phages and animal viruses. Bacterial protoplasts deprived of part of their cell wall can be infected with phage DNA in any one of its possible states. The multiplication of spontaneous phage mutations suggests that DNA is replicated geometrically by a series of reduplications according to the Watson-Crick system, and there is evidence for genetic recombination between phage elements and between the genetic material of phage and host. The genetic constitution of the phage can affect the cell-wall composition and other properties, as witnessed by the various conversion phenomena; the phage can transfer almost any genetic material from cell to cell by transduction; "as we interpret phage infection as genetic parasitism, we identify phages more and more closely with wandering portions of the cell genome. More generally, we must ask what role infective heredity has played and may still be playing in the evolution of genetic systems". Evidence for the genetic inertness of the viral protein in tobacco mosaic virus and several other RNA viruses in plants is not contradicted by any studies that have yet been made with animal viruses. In most cases the nucleic acid alone, if infectious, is less so than the mature virus, and these viruses are considered to be possibly related to cell microsomes "which, as part of the cytoplasmic reticulum, are probably the carriers of the coded determinants for protein synthesis in the cell protoplasm" and studies of virus multiplication may, it is thought, contribute to an elucidation of the mystery of the reproduction of these organelles and so to an understanding of the mechanism of replication of the basic units of life.

2144 MANSFELD, R.
Vorläufiges Verzeichnis landwirtschaftlich oder gärtnerisch kultivierter Pflanzenarten (mit Ausschluss von Zierpflanzen). [**A preliminary list of agricultural or horticultural plant species (excluding ornamental plants)**].
Kulturpflanze, Berlin 1959 : 2. Beiheft : Pp. v + 659.

This list comprises species cultivated throughout the world, forest trees being excluded. The families are arranged according to the system of Engler-Diels but the monocotyledons are placed after the dicotyledons. Important Latin synonyms and popular names are given, together with information on the region of cultivation and uses of the species listed; in some cases it has been possible to include notes on history and origin.

2145 ANGHEL, GH. *ET AL.*
Determinarea calităţii seminţelor. (**The determination of seed quality**).
Academiei Republicii Populare Romîne 1959 : Lei 25, 80 : Pp. 412 : 150 figs. : 23 tables.

This collaborative work provides a detailed survey of Rumanian seed-testing procedures. After an introductory chapter on the morphology and anatomy of seeds, successive chapters deal with the organization of seed testing in Rumania and elsewhere, testing for purity and the identification of weed seeds. In chapter VII, it is shown how weed seeds can be used to determine the provenance of seed samples, in particular from south Europe, east Europe, North America and South America and from different regions within Rumania.

Next, we have chapters dealing with the determination of authenticity in seeds and seedlings and techniques for measuring 1000-seed and hectolitre weights, vitreousness, husk percentage and moisture content. Germination, emergence and viability are treated in chapters X and XI and these are followed by chapters dealing respectively with fungal infection of seeds and insect pests of stored seeds.

Rumanian seed regulations are considered in the last chapter and there are appendices dealing with such topics as Rumanian standards for purity and germination and, of more particular interest to plant breeders, the 1000-seed and hectolitre weights of some of the more important Rumanian varieties of the principal crops.

The illustrations vary in quality; some are blurred.

2146 WHYTE, R. O.
Plant exploration, collection and introduction.
FAO agric. Stud. 1958 : No. 41 : Pp. ix + 117.

To quote the foreword: "A promising subject for an agricultural debating society might well be the theme: A plant is not without honour save in its own country, if by its own country is meant its centre of origin". This stimulating booklet should do much towards encouraging taking of the steps needed: reassessment of the biological and genetical bases of plant introduction, and perhaps also a revision or at least a reconsideration of Vavilov's centres of origin; the development of more efficient and scientific methods of conducting explorations and collections; and international collaboration in this field. In chapter 1, a picture is given of the recent intensification of interest in plant collection and introduction, reference being made to proposals at various meetings as to FAO activities. As background to the discussion, the second chapter provides a review of the origin of some representative plants which have been domesticated and taken from one environment to another in ancient and modern times. Genetical and physiological considerations are dealt with in the next chapter. Vavilov's principles are expounded and the application of the concept of centres of greater variability and formation of species to herbage-plant collection is discussed. In addition, the problems of genetic adaptation after introduction and homologous environments are considered in general. Chapter 4 deals with techniques in collection and introduction, while chapter 5 gives information on some recent and current projects and interests in the field of plant exploration and introduction, either on a limited or wider international basis. Chapter 6 discusses the receipt and maintenance of collections, largely with reference to the organization of this task in the USA. In the final chapter, suggestions are put forward as to ways in which international collaboration might be promoted and facilitated by an organization such as FAO. A bibliography is appended.

2147 HORSFALL, J. G. & DIMOND, A. E. (Editors).
Plant pathology: an advanced treatise. Vol. I: the diseased plant.
Academic Press, New York and London 1959 : $22.00 : Pp. xiv + 674 : figs. : tables.

The treatise, of which this is the first part, is designed to consider disease, not individual diseases, or, as the preface puts it, "the logistics and the strategy of disease and its combat". Different aspects are handled by different authors, the editors themselves presenting the first chapter, entitled The diseased plant; they explain why they have focussed attention on the suffering plant rather than on the causal agents; some misconceptions are removed, though not always without introducing others, as in the reference to "the arrival of the potato in Europe through the perspicacity of Sir Walter Raleigh". In the attempt to avoid confusing the symptoms with the disease, a classification has been adopted which leads to some unfamiliar and rather quaint chapter headings: tissue is disintegrated; growth is affected; reproduction is affected; host is starved; water is deficient; respiration is altered. There is no chapter on resistance because the editors wish to emphasize that defence is a dynamic state of affairs; there are therefore three chapters on defence in its different aspects: histology, physiology and biochemistry, and hypersensitivity, this last being included "chiefly because of its novelty and because it epitomizes a kind of inverted defense that appeals to scientists;" there is also a chapter on predisposition, and a final one on therapy. The chapter on Physiology and biochemistry of defence, by P. J. Allen, gives evidence for the role of toxic diffusates from the roots in preventing disease in a number of plants, the toxicity in most cases being non-specific. "Only a little evidence is available that indicates any participation of preexisting diffusible metabolites in differentiating between genetically resistant and susceptible varieties of host plants". Failure of infection resulting from the lack of some growth factors or other nutrients has been demonstrated in a number of cases but attempts to associate the presence of specific toxic substances within the plant with its resistance to pathogenic microorganisms are considered largely unsuccessful. The author concludes that "although the highly specific genetic control that has been found means that some highly specific chemical events are involved in starting the defense reactions, this does not mean that the actual agents of protection must be specific".

In the chapter on hypersensitivity, K. O. Müller traces the development of the concept since its first adoption by H. Marshall Ward in 1902. Data are given on hypersensitivity reactions induced by different types of fungi, viruses and bacteria. In a section on hypersensitivity as a genetic problem it is pointed out that hypersensitivity to a given physiological race is usually dominant in inheritance and controlled by a limited number of genes, which are often cumulative in action. A survey of existing information on different aspects of the phenomenon makes it clear that the interaction of the host and pathogen leading to the death of both partners cannot be explained on a purely nutritional basis. The author is satisfied however that some substance is liberated at the time of physiological breakdown of the cells of the host and the pathogen and that this substance "is the direct reason for the antipathogenic character of the hypersensitivity reaction." The term phytoalexin is adopted to denote this substance. It is believed that the cells of both the host and pathogen contribute to its formation and that enzymes are involved. The hypersensitivity reaction is considered as the norm and susceptibility only results when the normal relationships go wrong, probably through mutation of the pathogen.

Under the term predisposition, C. E. Yarwood understands "the tendency of nongenetic conditions, acting before infection, to affect the susceptibility of plants to disease"; it thus embraces changes towards greater resistance as well as greater susceptibility, but does not include genetic susceptibility; it is conceded that the two may be due to the same chemical or physiological causes, though the possibility is considered somewhat remote.

2148 WITHROW, R. B. (Editor).
Photoperiodism and related phenomena in plants and animals.
American Association for the Advancement of Science, Washington, D.C. : Publ. No. 55; and Bailey Bros. & Swinfen Ltd., London 1959 : 133s. : Pp. xvii + 903 : figs. : tables.

An international symposium was held in Gatlinburg, Tennessee, from 29 October to 2 November 1957, to discuss and correlate theories and observations on photoperiodism and related phenomena in both plants and animals. The present volume is a record of the proceedings of this meeting, which was held under the auspices of the Committee on Photobiology of the National Research Council, with the financial support of the National Science Foundation. Reports on current and previously unpublished research and review papers give a comprehensive if somewhat disconnected picture of the progress made in elucidating the various aspects of photoperiodism. It was decided not to record the extemporaneous discussions, but to allow those who wished to have their comments and ideas published to submit them in written form. Several short articles are included as the outcome of this policy. The 57 contributions are grouped under 11 sections. The first section deals with Photochemical principles and the second with the Photocontrol of seed germination and vegetative growth by red light. The third is devoted to the Role of chemical agents in photocontrol of vegetative growth. Crop breeders interested in fundamental physiological aspects of flowering will find the next three sections relevant: IV, Photoperiodic control of reproduction in plants; V, Growth factors and flowering; and VI, Analysis of plant photoperiodism. Section VII on The relation of light to rhythmic phenomena in plants and animals is followed by sections restricted to invertebrates and vertebrates.

2149 SHOLTO DOUGLAS, J.
Hydroponics. The Bengal system.
Oxford University Press 1959 : 3rd Ed. : 12s. 6d. : Pp. xii + 144 : figs. : 10 tables : 35 plates.

The cultivation of plants in artificial media has of course long been known as a laboratory technique, but it was not until about 30 years ago that the practical and commercial possibilities of the method became apparent. Since Gericke's first book in 1929, in which the term hydroponics was coined, soilless culture has been practised on an increasingly wide scale and various systems of sand and gravel culture have been developed in addition to the original solution culture system. This growth in interest has been fed by a steady stream of books on the subject, some sober and scientific, others enthusiastic and popular.

Mr. Sholto Douglas's book is of the latter kind. Written with the zeal of an advertiser, it is so lavish in its praise of hydroponics, so eager to assert the superiority of the method, particularly the Bengal system, over all others, that the cautious reader experiences an involuntary increase in scepticism and sales resistance with every sentence. That this should be so is a pity, for although the author's eulogies all too frequently take the form of repeated observations on how popular soilless culture is becoming, he does also give some impressive-looking figures showing the extraordinarily high yields obtained under hydroponic culture compared with normal agricultural and horticultural yields (although details of the conditions under which the comparisons were made are not included), and he does show that the method is practicable and may even be extremely valuable where normal soil culture is difficult or impossible. The Bengal system developed as a result of work begun in India in 1946 and, having evolved through the need to adapt the method to local conditions and available materials, requires no expensive equipment; also, it can be applied in climates and conditions other than those in which it originated.

The practical part of the book deals with the necessary apparatus and nutrient mixtures, describes the system in practice, outlines some general techniques, discusses the commercial possibilities and provides some miscellaneous notes on various aspects of the subject.

In addition there are chapters on plant growth and the future of hydroponics and three appendices, one on methods other than the Bengal system, another listing the main institutions concerned with research on soilless culture in various countries, and the third containing a bibliography. All this information, although presented rather unsystematically, will be useful to the aspiring hydroponicist.

The popular approach is, however, not infrequently combined with an unfortunate inattention to detail. This is so in the present volume. For example, the numerous text figures are unnumbered, are never referred to and appear to be scattered at random through the book regardless of their position in relation to the text; indeed, some of them are not only unexplained but so poorly drawn and inadequately labelled that they convey little useful information at all. Other points are the misnumbering of the tables, table V having been omitted, and the sketchiness of the index.

2150 DITTRICH, M.
Getreideumwandlung und Artproblem. (**Cereal transmutation and the species problem**).
Gustav Fischer Verlag, Jena 1959 : DM 20.15 : Pp. xii + 218 : 37 figs.

The author of this historical monograph has made a full study of the species problem and the question of *transmutatio frumentorum* through the ages. He starts with an examination of a number of references in the writings of ancient Greek authors; doubts entertained by Theophrastus and others concerning the conversion of wheat and barley (and flax) into *Lolium temulentum* are illustrated by citations. A number of references are cited from Roman authors concerning wheat changing into oats, rye, *L. temulentum* or other plants, most of which are shown to be susceptible of interpretation as cases of weed contamination. The first experiments, by Galen in the second century AD, are considered to be uncritical, though they have been quoted repeatedly by later writers. Basil and other clerical writers ascribed the conversion into *Lolium* to the multiplication of weed seeds already present.

In the Middle Ages references are cited from Albertus Magnus, Paracelsus and other writers, denials from Thomas Aquinas, Hieronymus Bock, C. and J. Bauhin and others. Many Medieval authors merely reproduce the statements from classical writers. A vast amount of folklore is also cited.

Reports of "metamorphoses" in the seventeenth century were also based more on transcription from earlier authors than on experiment. Among those who defended the immutability of species, John Ray, Malpighi and Camerarius are mentioned. In the eighteenth century *Bromus secalinus* was widely held to be only an inferior form of barley, rye or wheat. Koelreuter, Wiegmann and others regarded the transmutation of species however as a result of hybridization. At last we begin to read of deliberate experiments being made. J. G. Orth found no trace of *B. secalinus* in bad soils in experiments with carefully purified seed, even when he sowed at the time of a new moon! Other authors who supported Orth's view, also on experimental grounds, included, R. C. v. B. (1751), J. H. Deuffer (1755) and G. Rammelt (1756). We read then of the well known claim of Wirgin

(1705–83) to have converted oats to rye by mowing, which gave rise to a new round of speculations and experiments, the authors of which often employed terminology which is shown to bear strong resemblances to that of Lysenko in our times. It is characteristic that those writers who expressed disbelief in the possibility of transmutation usually based their views on the results of experiments; they include J. H. G. Justi, C. Reichardt and J. F. Gmelin; others, including Linnaeus and Kant, rejected it more on grounds of principle. The development of the idea of evolution in the early nineteenth century brought forth another flood of reports of transmutations, by E. von Berg, J. W. Saburow, C. F. Hornschuch and others, many of the cases being interpreted by others however as the result of hybridization, grafting or contamination; thus the opponents of transmutation include such authorities as Albrecht Thaer, F. X. Hlubek, Lorenz Oken, C. F. Gärtner, J. W. von Goethe, C. F. W. Jessen and A. von Humboldt. The views of Darwin are on examination rightly found to be somewhat uncertain, though definitely not in favour of large leaps from one genus to another; this principle comes to the fore in the works of Marx, Engels and Stalin and in the mutations of genetics. The views of T. D. Lysenko and his colleagues are reported in considerable detail, under three headings: conversion of one cultivated plant to another, conversion of cultivated plants to weeds and conversion of one weed to another. The examples drawn from forest trees and microorganisms are commented upon and the connexion between the Lysenko school and those of Lepešinskaja and Mičurin are explained; also the parallel with the experiments of Wirgin two centuries earlier.

Criticisms of the Lysenko conversion experiments are analysed, beginning with those of Turbin and Ivanov in the Soviet Union and of Stubbe and Rothmaler in Germany.

The final conclusion reached is that the idea of transmutation of one species into another, already existing species, has been disproved and is undialectical. It is further concluded that the exact nature of the leaps that occur in nature has not yet been decided. Somewhat surprisingly, a further deduction is that the controversy concerning conversions has enriched genetics by the light it has thrown on the effect of aging in increasing the mutation rate, on the difference between micromutations and macromutations, and on the importance of cytoplasmic inheritance, bud mutation and vegetative hybridization. The question of evolution and the species is, we are told, still the central problem of biology and much further effort in both theory and practice is necessary before "the complicated processes of life are discovered in their universal relationships."

2151 Whyte, R. O., Moir, T. R. G. & Cooper, J. P.
Grasses in agriculture.
FAO agric Stud. 1959 : No. 42 : Pp. ix + 417 : 23 figs. : 66 tables.

This global review of the adaptation, management, improvement and utilization of cultivated grasses in dryland and irrigated agriculture has been based upon information supplied by specialists in all parts of the world, either direct or through FAO National Committees and Ministries of Agriculture, upon the more recent literature and upon the personal experience of the authors. It is not intended as a text book but rather as a stimulus to discussion and further investigation, by indicating some of the problems which are the concern of grass specialists at the present time and by describing methods being adopted to overcome them. The first 11 chapters, making up part I, deal with general, economic and agronomic aspects. Plant introduction and testing introduced and native material and newly bred strains are among the topics discussed in a chapter on Procedures and designs in grassland research. Part II, on the Biology of grasses, contains four chapters respectively concerned with (1) ecological and biological relationships, (2) physiology and local adaptation, (3) plant introduction, selection and breeding, and (4) cytology in relation to breeding methods. Part III provides notes on the main characters, distribution, adaptability and utilization of the many genera and species of proven or potential economic importance. The survey is completed by a bibliography, glossary of bibliographical titles, subject index and index of botanical names.

2152 Ivins, J. D. (Editor).
The measurement of grassland productivity.
Butterworths Scientific Publications, London and Academic Press Inc., New York 1959 : 35s. : Pp. viii + 217 : figs. : tables.

The Sixth Easter School in Agricultural Science held at the University of Nottingham in 1959 [cf. XXIX, 2122] was concerned with questions connected with grassland, in particular the techniques available for measuring its productivity. The opening speaker, W. Davies, spoke on The evolution of grassland research techniques; the subject was treated historically. E. Klapp spoke on Twenty years of grassland recording on the experimental farm at Rengen, and T. E. Williams on The ley in relation to crop productivity. Part II dealt with herbage growth, the first contribution being The preliminary classification of herbage varieties, by R. P. Hawkins, who described observations made on the observation plots at the National Institute of Agricultural Botany, Cambridge. Measurements made on individual plants during the growing season have shown that there are differences not only between varieties but also between individual plants within a variety. "A variety of grass or clover must always be thought of as a population of individuals and never as an individual". Such features as date of flowering, though characteristic of a variety, vary considerably from year to year. Certain features found useful in identifying varieties of white clover, perennial ryegrass and red clover are indicated.

Ll. J. Jones spoke on Varietal characteristics of herbage plants in relation to their agronomic assessment; reference was made to varietal trials with ryegrass and cocksfoot in which the results were seriously affected by differences in habit, since a higher proportion of the growth was mown by the autoscythe in upright than in prostrate varieties. The results further show that the yield obtained from swards regularly mown may not indicate the true relative production of these varieties when subjected to grazing and the results obtained under one system of grazing may not apply for all other systems of grazing. Even for varieties producing the same total growth, its distribution over the season, particularly in early spring, may be quite different. The degree of damage from cutting or grazing depends on the developmental stage at which the plant is cut, being greater when stem elongation has set in. Varietal differences were observed in various grasses in respect of winter burn, winter hardiness, persistency and aggressiveness, palatability and even the extent to which animals thrive when feeding on them.

Problems of measuring herbage production in small plots were discussed by J. O. Green. Part III was devoted to the consumption of herbage by livestock, Part IV to animal production from grassland and Part V to farm-scale measurements.

2153 BUKASOV, S. M. & KAMERAZ, A. JA.
(Bases of potato breeding).
Gosudarstvennoe Izdatel'stvo Sel'skohozjajstvennoj Literatury, Moskva-Leningrad 1959 : 11 r. 70 k. : Pp. 528 : 34 figs.: 41 tables. [Russian].

The ground covered by this new book is much the same as that of an earlier volume [cf. XXVI, p. 328], though the matter has been largely rewritten and extended and the order much altered. The first chapter is devoted to the potatoes of S. America and their classification. The authors consider the sections *Rotata* and *Stellata*, the series *Conicibaccata* and many other subdivisions of the genus *Solanum* to be based on erroneous conceptions. Entire leaves are regarded as a primitive character from which various types of dissected leaves have evolved. Other characters towards which the species are thought to have evolved are long stems, rosette habit, large tubers, long stolons, articulated pedicels, dissected corolla and multifloral inflorescence. The increase in chromosome number by polyploidy often reversed some of these evolutionary trends.

The authors support the establishment of sections *Tuberarium* and *Hyperbasarthrum* as effected by Bitter in his emendation of 1914, and disagree with the purely morphological taxonomy adopted by Correll and by Hawkes. The diploid and triploid species established by Juzepczuk and Bukasov are defended on cytological, ecological and morphological grounds, *S. andigenum* on physiological and morphological; the view is expressed that the diagnosis of *S. tuberosum* given by Hawkes would include all species of series *Tuberosa* and *Andigena*, both cultivated and wild; the inclusion of *S. leptostigma*, *S. subandigenum* and *S. curtilobum* is thought to be quite unjustified. The system presented by the authors divides section *Tuberarium* into N. and S. American groups, the latter being subdivided into Pacific, Atlantic and Andean subgroups; the Pacific subgroup is divided into series *Tuberosa* and *Vaviloviana*; the ephemeral Peruvian species of the latter series are grouped together with the Peruvian species of *Tuberosa* and *S. maglia* in an ecological group, the Araucarian, and insular Chilean species into another, containing *S. tuberosum*, *S. molinae* and *S. leptostigma*. The Atlantic subgroup contains series *Commersoniana*, *Glabrescentia*, *Cuneoalata*, *Megistacroloba*, *Acaulia* and *Circaeifolia*. The Andean subgroup contains series *Transaequatorialia*, in which *S. simplicifolium* forms a link with *Tuberosa*, and series *Andigena*. The authors reject the suggestion of *S. vernei* as a possible ancestor of the domestic potato. North of the equator are series *Piurana*, *Conicibaccata*, *Oxycarpa*, *Pinnatisecta*, *Morelliformia*, *Bulbocastana*, *Cardiophylla*, *Polyadenia*, *Longipedicellata* and *Demissa*. A table is given showing the 22 series of section *Tuberarium* and the species comprised in each. Descriptions are then given of the cultivated species of S. America and of their cultivars.

Chapter 2 brings the outline of the results of potato breeding in different countries up to date, the number of countries dealt with being considerably expanded. Chapter 3 comprises sections on breeding for particular qualities, starting with wart resistance; data are given on the biotypes of *Synchytrium endobioticum* and a table shows the reactions of all species that are known to possess resistance; the resistant varieties and forms of *S. andigenum*, *S. tuberosum* and other species are enumerated; cultivars are then arranged in the order of the percentages of wart-resistant seedlings they normally give in their progenies; in crosses of two resistant parents as many as 90% of the progeny may be resistant; this applies to dispecific and trispecific hybrids such as those involving *S. demissum*, *S. andigenum* and *S. tuberosum*. The progeny from selfing resistant hybrids normally produce about 75% of resistant seedlings, though some produce more. Details are given of the results obtained in crosses of species belonging to the series *Glabrescentia*, *Transaequatorialia*, *Andigena*, *Tuberosa* and *Longipedicellata*; resistance to the aggressive biotypes has appeared in hybrids from K. O. Müller's line 9089 from Chiloé, and from a form of *S. andigenum* from Ecuador. Hybrids resistant to the German biotype G have been obtained from *S. demissum*, *S. vallis-mexici*, *S. andigenum* and other species. The best domestic varieties for transmitting wart resistance are Gladstone, Imandra, Priekuļi Early and Kameraz 1.

Resistance to *Phytophthora infestans* is treated next. The biology of the fungus and the problems arising from its specialization are explained, recent literature on the genetics of resistance is reviewed; and the methods used in testing for resistance are described. The first aggressive biotype appeared in the Soviet Union in 1951. Most seedlings that were resistant in the tubers were also resistant in the leaves but the converse did not always hold, particularly in the case of aggressive biotypes. The experience of the authors in testing the species for resistance is compared with that of other workers; apart from the Mexican species, no species with any marked degree of resistance to the aggressive races has been found; in general *S. andigenum* is less susceptible than *S. tuberosum* and a number of forms possessing the capacity to delay the incubation time of the fungus are enumerated, as this type of resistance is considered to be of probable importance in future breeding work. The most valuable sources of resistance to the aggressive biotypes are thought to be *S. demissum*, *S. semidemissum*, *S. antipoviczii* and *S. vallis-mexici*; species of the sections *Bulbocastana*, *Polyadenia* and *Cardiophylla* possess resistance but are difficult to use in crossing. Details are given of those species that have been crossed with *S. verrucosum*, *S. semidemissum*, *S. demissum*, *S. brachycarpum*, *S. guerreroense* and *S. spectabile*. The many hybrids and back crosses produced from *S. demissum* are described in full; it is pointed out repeatedly that the success of these crosses depends on the correct choice of the domestic parents. The back cross to *S. tuberosum* usually gives quite good yields and in the second back cross [(*S. demissum* x *S. tuberosum*) x *S. tuberosum*] some plants bore as much as 2950 g. of tubers. Further back crossing then tends to diminish yields because of inbreeding but the selfed progeny of some of the second back crosses have given quite good yields, varying from 1000 to 2000 g. per plant. Hybrids with a high starch content in the tubers appear in the early generations of these hybrids, some of them having up to 31·2% of starch. Some of the hybrids have up to 1% more protein in their tubers too. The number of seedlings with short stolons rarely exceeded 5% in the first to third back crosses and about twice this after tuber reproduction combined with selection. The proportion of tubers of good shape and with shallow eyes is often higher in the progenies from Katahdin than those from most other cultivars and quite good tubers were obtained in crosses of the type *S. tuberosum* x (F_2 *S. demissum* x *S. tuberosum*); they have not however been found so far in the hybrids giving the highest yields. No difficulty has been experienced in producing hybrids with satisfactory flavour. Resistance, even to the aggressive races, was usually dominant in the F_1 as regards infection in the field. In the F_2 from resistant plants, up to 78% of the plants were resistant to the common and 37% to the aggressive races. In the first back cross the proportions were 18% and 3·9% and in later generations generally lower still but a few forms resistant to the aggressive races do occur; one of these appeared in the F_2 of a fourth back cross, the parentage of which was

Coerulia x {[Doon Pearl x (*S. demissum* x Gloriosa) x Katahdin] x Stärkeragis}, the plant that was selfed being resistant to the aggressive races in both leaf and tuber. In addition, quite a number of the seedlings have been found to possess the delayed-incubation type of resistance, this being particularly strong in some complex hybrids from *S. semidemissum*, in some of the later generations of *S. demissum* x *S. tuberosum* crosses and in some complex crosses involving *S. demissum*, *S. andigenum* and *S. tuberosum*, or other species such as *S. antipoviczii*, *S. vallis-mexici* and even *S. acaule*. Some of these hybrids even proved resistant after artificial infection. One generation of crossing with *S. andigenum* in place of *S. tuberosum* frequently increased the yield, sometimes also the tuber size, without altering the starch content; the stolon length was however usually increased and the tuber form inferior. Some quite promising hybrids of this type were obtained when using *S. andigenum* var. *bolivianum*. The proportion of resistant seedlings was generally higher in progenies obtained by intercrossing the *S. demissum* x *S. tuberosum* hybrids, provided the right choice of hybrid is made; there is however usually a deterioration in yield and size and shape of tuber.

Some promising seedlings have been obtained in second and third back crosses of *S. semidemissum*, some of them being resistant to the aggressive blight races in the field, though not in artificial infection of the tubers. By crossing these hybrids with the *S. demissum* hybrids several seedlings with delayed-incubation resistance appeared. Reference is made to the production in Germany of hybrids resistant to blight and virus infection in crosses of the hexaploid species, *S. salamanii*, and of delayed-incubation and other resistances in complex hybrids involving *S. verrucosum* and *S. demissum*. Hybrids have been obtained from the hexaploid form of *S. vallis-mexici* ($2n = 72$) in crosses with *S. tuberosum*, and one back-cross seedling, which is resistant to the common and aggressive blight races, early in maturity, good in yield and tuber form and high in starch content, is being tested under the name Puškinskij. Many other back-cross seedlings possess incubational resistance. *S. antipoviczii* (= *S. stoloniferum*) is difficult to cross with other species, and the hybrids in the later generations, though some are resistant to the aggressive races, mostly show a preponderance of the wild characters; promising hybrids have however been selected, some of them having incubational resistance and others resistance to virus A and Y. It is thought that similar results should be possible in crosses with *S. longipedicellatum* and other species of the series. No promising seedlings have been obtained from *S. ajuscoense* though a number of species with which it has been crossed are enumerated. Resistant hybrids have been obtained, though with great difficulty, from *S. polyadenium* x *S. jamesii* and reference is made to the production by other workers of hybrids of *S. tuberosum* x *S. polyadenium* ($4n$). All hybrids of *S. jamesii* were seedless except those with *S. commersonii*, *S. phureja* and *S. polyadenium*. A hybrid of *S. bulbocastanum* x Jubel had only 6 seeds. No species of series *Cardiophylla* has yet been crossed with the domestic potato.

A table is given showing the ten crosses giving the greatest number of seedlings resistant to the aggressive blight races in 1956 and 1957; a list of cultivars known to possess blight resistance is given, with indications of their resistance genes; and finally, tubers of four blight-resistant varieties produced at the Institute of Plant Industry are illustrated.

Chapter 5 deals with breeding varieties resistant to other fungous and some bacterial diseases. Resistance to *Macrosporium* (*Alternaria*) *solani* has been found in several species of series *Acaulia*, *Glabrescentia* and *Andigena*; most forms of *S. demissum* and their hybrids are susceptible. Resistance to dry rot (*Fusarium* spp.) is reported in the cultivars Epicure, Jubel, Wohltmann and Parnassia, and resistance to wilt [*F.*(*Hypomyces*) *solani*] in several cultivars, in species of series *Acaulia*, and in *S. demissum*, *S. antipoviczii* and *S. commersonii*. Several cultivars, including Wohltmann, Lorh and Jubel, are mentioned as resistant to *Verticillium albo-atrum*. No variety has been found to possess true resistance to *Rhizoctonia solani* (*Pellicularia filamentosa*), though some are mentioned as being more tolerant than others. The literature on resistance of cultivars to scab (*Streptomyces scabies*) is reviewed; in the Soviet Union, resistance has been found in species of sections *Commersoniana*, *Glabrescentia* and *Polyadenia*. Varieties and species resistant to *Spongospora subterranea*, *Spondylocladium atrovirens*, *Oospora pustulans*, *Erwinia phytophthora* (*E. atroseptica*), *E. carotovora*, *Corynebacterium sepedonicum* and *Pseudomonas solanacearum* are indicated.

Chapter 6 presents information on resistance to virus diseases and the symptoms produced by the different viruses; the methods used in their identification and the types of resistance are described and the literature on resistant varieties is reviewed. Observations in Leningrad have shown *S. acaule* 'D6–1510' to be free from infection by virus X, to which relative resistance was found in *S. schreiteri* 'D3–993'; an F_3 seedling of *S. depexum* x Priekuļi Early and some seedlings of *S. parodii* and *S. sucrense* were also free from infection. Necrotic reaction was observed in seedlings of Fortuna. Resistance to virus A was found in *S. schenckii* 'K–2504' and *S. antipoviczii* 'D4–663' and in some seedlings of *S. longipedicellatum* 'D6–1384' and in F_4 *S. demissum* 'D023' x *S. antipoviczii* and F_3 *S. longipedicellatum* 'K–2492' x *S. schenckii* 'K–2536'; strong necrotic reaction was observed in *S. demissum* 'K–2990'. Freedom from infection by virus Y was observed in *S. etuberosum* 'K–2489', *S. antipoviczii* 'D4–663', *S. malinchense* 'D6–1477' and *S. schenckii* 'K–2504', necrotic reaction in seedlings of *S. longipedicellatum* 'D6–1384' and *S. chacoense* 'K–2866' and certain domestic potato hybrids such as Imandra; some *S. andigenum* seedlings showed tolerance. Resistance to leaf roll is available in certain clones of *S. acaule*, *S. demissum*, *S. chacoense*, *S. andigenum* and their hybrids.

Resistance to insects forms the subject of chapter 7, the first to be considered being the Colorado beetle (*Leptinotarsa decemlineata*). Resistant forms have been found in the series *Commersoniana*, *Glabrescentia*, *Transaequatorialia*, *Circaeifolia*, *Demissa*, *Polyadenia* and *Pinnatisecta* and a table gives information on the reaction of the species within each section. The resistant species are found mainly in Mexico and in Argentina, Uruguay and Paraguay. No resistant seedlings have been found in *S. chacoense* and the species referred to under this name in the international literature is regarded as *S. schickii*, which has given some 3·5% of resistant seedlings in the USSR. Other species giving resistant seedlings are *S. gibberulosum*, *S. parodii*, *S. emmeae*, *S. boergeri* and *S. horovitzii*. The resistant species referred to by Torka as *S. catarthrum* is thought to be some wrongly identified member of series *Glabrescentia*. Resistance has also been found in *S. macolae* in series *Transaequatorialia*, *S. capsicibaccatum* in series *Circaeifolia*, *S. demissum* in series *Demissa*, *S. polyadenium* in series *Polyadenia* and *S. jamesii* in series *Pinnatisecta*. Resistant segregates have also been found in certain crosses between susceptible parents, such as *S. acaule* x *S. tuberosum* or *S. andigenum* x *S. tuberosum*. The species considered most promising in breeding for resistance are those of series *Glabrescentia* and the cultivars that have given the best results in pollinating them are Kameraz 1, Oktjabrenok and Cobbler. Some of the seedlings in the first back-cross of hybrids from *S. gibberulosum*, *S. schickii*, *S. saltense* and *S. subtilius* had quite high tuber yields, reaching from 1360 to 1645 g. per plant; in the second back cross and their tuber progeny still higher yields were obtained, going up to 3000 g. per plant in crosses with *S. parodii*; the tuber size and shape and starch content also improved, values of over 25% being reported in hybrids from *S. schickii* and *S. subtilius* and over 30% in those from *S. saltense* and *S. horovitzii*. Protein contents of 2–2·5% were found in some of the hybrids, compared with 1·4–1·5% in Cobbler; these hybrids were however low in yielding ability. Many of the hybrids had very good tuber flavour in the later generations. By a suitable choice of back-cross parents it has been possible to impart to the hybrids resistance to blight, scab, wart, wilt and other diseases; resistance to the mature Colorado beetle has been found in the hybrids from *S. subtilius*, *S. parodii*, *S. schickii*, *S. gibberulosum*, *S. saltense*, *S. emmeae* and *S. horovitzii*. In crosses from *S. subtilius*, some of the back crosses exceeded the standard cultivars in yield and starch content but most of them had long stolons and deep eyes; a table shows the parentage of 10 of the most promising resistant hybrids; another shows those of five hybrids of *S. gibberulosum* which are avoided by the beetles when they have the choice and cause 56–60% lethality when they are forced to feed on them; other, complex, hybrids caused a lethality of 73–76·6%. Though some forms of *S. demissum* are resistant to the larvae, no resistant hybrids have been produced so far. Although hybrids have been produced between the diploid species *S. polyadenium* and *S. jamesii*, no back crosses have yet succeeded.

Resistance to *Epilachna vigintioctomaculata* and *E. vigintioctopunctata* has not been found in *S. tuberosum* or *S. andigenum*, though differences in the capacity to regenerate after attack have been established. Most of the wild species resistant to Colorado beetle are also resistant to *Epilachna* and their behaviour is described. Resistant hybrids have been obtained in crosses of *S. chacoense*, *S. garciae*, *S. gibberulosum*, *S. horovitzii*, *S. parodii*, *S. saltense*, *S. schickii* and *S. subtilius*. Some of these hybrids, particularly those from *S. gibberulosum*, *S. parodii* and *S. saltense*, were distinguished by quite good tuber yields. Resistant hybrids have appeared in crosses of species in sections other than *Glabrescentia*, such as *S. demissum*, *S. depexum*, *S. antipoviczii* and *S. macolae*, those from *S. demissum* having occasionally exceedingly good yields. Though resistance to *Epilachna* generally goes parallel to that for Colorado beetle, the degree of resistance to *Epilachna* is usually lower owing to the polyphagous habits of the insect.

Notwithstanding the title of chapter 7, resistance to nematodes is also treated in that chapter. The work of Ellenby [XXV, 2185], Goffart and Ross [XXV, 380] and others is reviewed. Observations on over 2000 specimens made by Soviet investigators are reported, figures being given for the relative number of cysts found in the roots of different species. The most resistant are given as *S. ballsii* and certain forms of *S. catarthrum* and *S. andigenum*; line K–2952 of *S. andigenum* obtained from Schick is mentioned particularly. No resistance has been found in *S. sucrense*. Berries have been obtained in crosses of *S. ballsii* with 9 different species, including *S. tuberosum* and *S. andigenum*; the number of seeds however is very low and they have not yet been tested for germination. Hybrids of *S. ballsii* x *S. phureja* segregated for resistance. *S. catarthrum* has been crossed with 6 other species and hybrids of quite good commercial quality have been obtained in certain back crosses of the hybrids with *S. tuberosum*, some of them having a fairly high degree of resistance. Resistance to the stem nematode (*Ditylenchus destructor*) has not so far been studied in the USSR.

Chapter 8 deals with the production of varieties that withstand unfavourable conditions of growth, starting with the warm humid conditions of the irrigated areas; some cultivars are more prone to the production of small supernumerary tubers than others; *S. andigenum* is less sensitive than most domestic varieties; *S. molinae* is tolerant of warm humid conditions and *S. infundibuliforme* to drought. Attempts to breed frost-resistant potatoes have been made by crossing with *S. acaule* and related species, with *S. demissum* and with *S. curtilobum*, the first and third being used only for northern conditions where late blight is absent. Reference is made to frost-resistant hybrids obtained by N. A. Lebedeva by grafting Katahdin on to *S. punae* and back crossing twice to *S. tuberosum*; they are early, have good tubers and rather long stolons but yield 12–47% more than the standard cultivars. Many hybrids of *S. demissum* germinate at temperatures below the normal of 20°C. Most forms of *S. andigenum* are more hardy than the domestic potatoes and a certain degree of frost resistance has been found also in *S. ajanhuiri*, *S. commersonii*, *S. millanii*, *S. depexum* and certain other species. Resistance is not directly correlated with content of sugars or dry matter. Internal rust spot due to P deficiency varies and a table is given showing the relative susceptibility of different cultivars. Earliness is considered in chapter 9; early varieties with fertile pollen, suitable for use as parents, are enumerated, together with some of the cultivars to which they have given rise. The section on the production of varieties giving two tuber yields a year is reproduced from the previous edition, with the addition of the names and pedigrees of three such varieties that are now in cultivation, two of which are derived from *S. boyacense* and one from *S. caniarense*.

Breeding for chemical composition is dealt with in chapter 10. First comes starch content; F_1 hybrids with up to 32% of starch in the tubers have been obtained from crossing *S. leptostigma* and *S. molinae* with high-starch cultivars such as Moskvič [Muscovite] and Robusta, values of up to 27% being recorded in the F_2 and up to 24% in the second back cross. The highest values are not generally found in the hybrids with the best yields and other qualities, and the best hybrids in these respects had starch contents of 20–24·2%, found in some complex hybrids involving *S. demissum*. The highest content of ascorbic acid, 22·0 mg.%, has been found in *S. antipoviczii*, next in order being *S. rybinii*, *S. kesselbrenneri* and *S. araccpapa*. Figures are given showing the superiority of potatoes to cereals in respect of yield of protein per acre and of the biological quality of the protein. Contents of crude protein of over 5% have been recorded in the Leningrad area for tubers of a number of species. Thus for *S. phureja* values of up to 7·65% of the fresh weight are reported, for *S. andigenum* var. *aymaranum* up to 6·68%, for *S. emmeae* up to 6·06% and for *S. demissum* up to 5·55%; high values were recorded also for *S. semidemissum*. The mean value for domestic cultivars over a five-year period did not exceed 2·5%. A high combination of protein and starch was recorded for *S. parodii* and high protein and dry matter in *S. molinae*, *S. leptostigma* and *S. maglia*. Certain cultivars such as Marija Hrennikova, derived from crosses with *S. andigenum* var. *longibaccatum*, have protein contents of 2·5% and give a yield of 8·17 c. of protein per ha. Tabular data for the protein contents of a number of hybrids show that values of over 2·5% were obtained in *S. kesselbrenneri* x *S. rybinii* and *S. rybinii* x *S. tuberosum* and in some complex hybrids from *S. demissum* very few of them had also a high starch content but some combined protein contents of almost 3% with a dry-matter content of 22%; the frost-resistant hybrid 6259, from *S. acaule* x Jubel x Sverdlovskij, with 3·93% protein and 28·4% dry matter, had a low tuber yield. A rapid method of estimation of protein content on a 5 g. sample of crushed tubers, based on the determination of the volume of NH_3 released after treatment with NaOH, is described.

The last two chapters are devoted to methods of potato breeding and seed production. Clonal selection is discussed, reference being made to the work of I. E. Gluščenko [cf. XXVI, 2565]; no completely healthy plants have been obtained from adventitious buds of tubers suffering from virus diseases, though differences have been noted in the degree of infection. Hybridization and sterility are considered and a table shows the behaviour of a large number of varieties, arranged in alphabetical order, in respect of wart resistance, suitability as pollinators, and characteristics of their seedlings in regard to yield, starch content, form, colour and flavour of tuber, earliness and fertility. As in the earlier volume, various methods of overcoming sterility and interspecific incompatibility are suggested and the intercompatibility relationships of 92 different species, and some of their polyploid derivatives, are tabulated.

2154 HUTCHINSON, J.
The application of genetics to cotton improvement.
Cambridge University Press 1959 : 15s. : Pp. viii + 87 : 3 tables.

The relatives of the cottons form the first subject of discussion in this small volume based on lectures delivered in 1954 at the North Carolina State College. Descriptions are given of the wild and cultivated species of *Gossypium* and of some related genera such as *Thespesia*, *Gossypioides* and *Cienfugosia*, particular attention being drawn to the fact that the pattern of changes that have occurred under cultivation is radically different from that which would have been expected from a study of diversity in the wild relatives; it has evidently been imposed by the forces of selection rather than by the genetic potentialities of the material.

Chapter 2 deals with the origin of the Old-World cottons. *G. herbaceum* race *africanum*, a wild cotton of southern Africa, is now regarded as representing the primitive type from which the cultivated diploid cottons originated, southern Arabia being considered the area where it was first domesticated. This led to the selection of annual forms which later, it is argued, penetrated into India; the original perennial forms are thought to have given rise, in India, to *G. arboreum*, some forms of which were brought by traders to eastern Africa; annual forms later developed from *G. arboreum* and these spread into Indonesia and the Far East. The New-World cottons, forming the subject of chapter 3, are regarded as relatively recent allopolyploids based on the Old-World species *G. herbaceum* and some wild New-World species such as *G. raimondii*. The evidence for trans-Atlantic or trans-Pacific contacts that would have made this possible in prehistoric times is considered unconvincing. Data are cited showing that at a date somewhere around 2500 BC perennial cottons with short, coarse lint strongly resembling the wild cottons of *G. barbadense* found there today were being used in Peru. The Sea Island and Egyptian cottons today are regarded as derivatives of these early cottons of Peru. *G. hirsutum* apparently originated in Central America, whence it spread into South America and gave rise to a large range of perennial cottons, some of which show signs of introgression from *G. barbadense*. Race *punctatum* of *G. hirsutum*, when taken to Africa, largely supplanted the Asiatic cottons and gave rise to true annual forms; in Egypt introgression with *G. barbadense* has again taken place. Race *latifolium* gave rise to the annual Upland cottons of North America, which have supplanted most other cottons in many parts of the world, including most parts of Africa other than the Nile Valley. The third allopolyploid species, *G. tomentosum*, is wild and endemic in Hawaii. No suggestion is made as to how it arose.

Examples of the transference of genes from one species to another include the transfer by Knight of the genes for resistance to bacterial blight from *G. hirsutum* to *G. barbadense*. The difficulties that attend such transfers are however taken to point to the relative rarity of introgression in nature.

In considering the evolution of the cottons in chapter 4, it is shown how domestication led inevitably to greater variability, with the consequence that range of variability increases rather than diminishes on passing away from the centre of origin. The relatively rapid change that can occur in the genetic make-up of a population under cultivation is illustrated by the development of virtual immunity to bacterial blight in cottons in West Africa originating from forms of *G. hirsutum* race *punctatum* that had a very low degree of resistance when introduced some 200 years ago [cf. XX, 2443] and the production of jassid-resistant cottons by selection for hairiness [cf. XXIII, 1324].

Chapter 5, on breeding systems, shows how continued improvement, by selection, of an initially successful strain such as U4 cotton progressively restricted its range of variation and hence the area to which it is adapted. Reference is made to the successful use of the selection index in selection, by which means a yield increase of some 4% per generation has been achieved [cf. XXVII, 1976]; but the disadvantage of impoverished genetic variability that is entailed is emphasized in chapter 6, outlining the main improvements that have been effected by cotton breeding in different parts of Africa, and details are given of a scheme for building up a segregating population in which the gene content of nineteen different stocks is randomly assorted, the initial stocks providing such characters as high yield, large boll, hairy leaf, quality and resistance to bacterial blight and jassid. Such a mixed population has, among other things, produced forms having a vegetative development more suited to the climatic conditions of certain areas than any so far in existence.

2155 SIMMONDS, N. W.
Bananas.
Longmans, Green & Co. Ltd., London 1959 : 45s. : Pp. xvi + 466 : figs. : tables : 87 plates.

This further number in the series [cf. 953], we are told, is designed to meet the needs of three groups of readers: first, the research worker who needs a ready source of information, complete with bibliographies, on scientific aspects of the crop; second, the government agricultural official who, while not requiring the same scientific detail, needs a source of information on cultivars and on agricultural aspects of banana cultivation; and, third, the planter who may wish to understand why a certain practice is recommended and whether and in what particulars he can safely depart from locally accepted methods of management. Chapter 1 deals with taxonomy and morphology, the main characteristics of the different sections of the family Musaceae of the Scitamineae being outlined. In this chapter, as well as several later ones, some useful enlightenment concerning the esoteric and often mystifying terminology used by banana growers is provided. The structure and development of flowers and fruits form the subject of the second chapter, and classification of cultivars that of the third; the edible bananas are classified into two series, *Australimusa* and *Eumusa*. A scoring system is employed which enables the cultivars to be classified according to their degree of resemblance to *Musa acuminata* and *M. balbisiana* respectively. The *Eumusa* cultivars fall into six groups, of which two are diploid ($2n = 22$), three triploid and one tetraploid; two of the groups are derived solely from *M. acuminata* and the others are hybrids; fewer than half the cultivars of the world are sufficiently well known to classify accurately and no attempt is made to give them standard names. At least seven botanical names have been applied to different types, two of them applying to recognizable triploid hybrids, one to a mutant and one to a botanical freak; two are synonyms and one is unidentifiable. Hence "no one Latin name can possibly apply to all the *Eumusa* cultivars", and the author has decided to disregard all Latin names until such time as the taxonomy of bananas has been completely worked out. It is unfortunate that in questions of nomenclature he refers not to the latest edition of the International Code of Nomenclature of Cultivated Plants [XXVIII, 2425] but to the previous edition published in 1953. A number of cultivars have arisen by somatic mutation and a classified list of these is provided; one of them is the Dwarf Cavendish, the second most abundant banana in the world, and it is even suggested that the whole plantain subgroup may owe its origin to somatic mutation.

The cultivars themselves are described in the next series of chapters, starting with the Australian group, the most frequent representatives of which occur in Tahiti and other Pacific islands; they are all starchy, being eaten only after cooking; their chromosome number is $2n = 2x = 20$. The first group of *Eumusa* cultivars comprises the Gros Michel, the Cavendish and the Red subgroups. Next comes a hybrid, IC2 or Golden Beauty, resistant to Panama disease and leaf spot, and this is followed by the plantains and a series of less widely distributed types. Annotated lists of clones according to countries include indications of the value of certain clones for breeding purposes. Present estimates suggest that "there must be about 300 distinct bananas, 150 primary clones, and, say, 150 easily recognizable mutants. The true number probably lies somewhere in the range 200–500". The ratio of *acuminata* types to hybrids is about 2 : 1. The present centres of diversity are different from the presumed centres of origin.

Chapters on climate and soil, planting and management, harvest, transport and ripening, composition and utilization, production and economics are interpolated here and then follows the chapter on origins. Bananas have probably, we are told, been used as long as man has existed. The first step in the evolution of the edible bananas is thought to have been the origin of parthenocarpy in *M. acuminata*, probably in Malaysia; then came polyploidy and later, apparently in India and the Philippine area, hybridization with *M. balbisiana*. The *Australimusa* series is thought to have arisen from wild species in the area of New Guinea and the Solomon Islands. The first mutant, the horn banana, was apparently referred to in a Hindu script of 350 BC. The banana seems to have entered Europe with the Islamic conquerors but it is suggested that it reached Africa direct from south-east Asia at an earlier date. Any possibility of the presence of bananas in America in pre-Columbian times is rejected.

The development of banana cultivation in different parts of the world is traced. There follow chapters on pests and diseases and a final chapter on breeding, an outline being given of the banana-breeding activities of the Imperial College of Tropical Agriculture in Trinidad. Since the breeding aim has been the production of a banana as nearly as possible resembling Gros Michel but possessed of resistance to Panama disease and leaf spot, only material of *M. acuminata* has received serious attention. The merits and defects of the various male parents used so far are examined. The wild strains of *M. acuminata* previously used as pollinators were superseded by the edible diploid Pisang lilin, the Candle banana of Malaya; this in turn has been replaced by synthetic male parents. The triploid Gros Michel or its mutants have been used almost exclusively as female parents. A bibliography comprising the main literature on breeding and cytogenetics of bananas completes the chapter, and the volume is provided with separate indexes of personal names, place names, clone names and scientific names as well as a general index. It is profusely illustrated with photographic reproductions of varying quality.

2156 Zycha, H.

Die Pappel. Anbau, Pflege, Verwertung. **(The poplar. Cultivation, care and use).**

Verlag Paul Parey, Berlin & Hamburg
1959 : DM 14. : Pp. 121 : 57 figs. : tables.

The first chapter of this poplar handbook is contributed by E. Röhrig and is devoted to species and varieties. A survey is given of the taxonomic differences between the genera *Salix* and *Populus* and of the various sections of the latter genus, followed by a description of the individual species, indications being given of the sylvicultural qualities of the species and of their different races or cultivars. Information is provided on origin, area of distribution, mode of reproduction and such biological features as compatibility with other species and the occurrence of heterosis in the hybrids. The term *P.* x *canescens* is taken to denote any types that appear intermediate between *P. alba* and *P. canescens* and *P.* x *euramericana* is similarly used for types intermediate between *P. nigra* and the American species of section *Aigeiros*.

Descriptions are given of the main cultivars of *P. nigra* grown in Germany and of some that are restricted to certain localities and of a certain number of cultivars introduced from abroad. The descriptions include indications of origins, synonyms, distinguishing features, sex, industrial uses, earliness and resistance to diseases. Certain sources of confusion are cleared up and German sylviculturists are urged to discontinue the practice of using the term *regenerata* for a different cultivar from that known as *P. nigra* 'Regenerata' in other countries.

Chapter 2 describes the conditions of habitat that are suitable for poplars in general and refers to experiments now in progress which are designed to test the ecological requirements of the individual cultivars; the observations made so far suggest that *P. nigra* 'Robusta' has an early maximum development whereas cvs. 'Serotina' and 'Marilandica' reach their maximum later. The species of section *Tacamahaca* and their hybrids with *P. nigra* appear to be more suited to heavy soils. *P. tremula* has lower heat requirements and all species of section *Leuce* seem to be less exacting as regards humidity, temperature and soil quality than those of other sections.

Sylvicultural measures are treated in chapter 3, diseases and pests in 4 and 5 respectively, yield in 6 and utilization in 7. The bibliography consists of a selected list of 52 references.

2157 Umbreit, W. W.

Advances in Applied Microbiology. Vol 1.

Academic Press, New York and London
1959 : $9.50 : Pp. xi + 304 : figs. : tables.

Still another series of reviews now appears, the object of which is "the publication of critical and definitive reviews of those areas of microbiology which are of interest to the practical microbiologist". The majority of reviews are by American authors but two are from workers elsewhere, in Czechoslovakia and Japan respectively; they discuss material said to be not readily accessible to the general reader; the latter is by S. Kinoshita, who writes on The production of amino acids by fermentation processes; from studies of several thousands of microorganisms belonging to different strains and species, it has been possible to isolate some that accumulate a specific aminoacid in substantial quantities. So far no relationship has been found between the aminoacid production pattern and the morphological classification of the species. The strains found capable of producing glutamic acid are all gram-positive, non-sporulating, catalase-positive and biotin-requiring cocci, and have been named *Micrococcus glutamicus*; they can produce more than 30 g. per litre of glutamic acid under aerobic conditions from a medium comprised mainly of glucose and urea or ammonium salts. One of the advantages of using this method of synthesis for industrial purposes is that only l-glutamic acid is produced. A number of mutants of *M. glutamicus* have been obtained by using ultraviolet radiation or Co^{60} and two of them have a capacity for lysine production that is suitable for commercial use, the fermented broth often containing as much as 2% (w/v) of lysine. Other mutants are able to produce about 25 g. per l. of l-ornithine, the molar yield being about 0·36 mol. per mol. of glucose. Good producers of l-valine have been found in some of the Enterobacteriaceae and of l-alanine in strains of *Pseudomonas* and *Streptomyces colicolor*. Tryptophane is also being produced commercially by microbial fermentation.

There is a review by D. Palmer on The status of antibiotics in plant disease control, in which the problems of selective toxicity and translocation within the plant are examined. Among the most interesting of the results mentioned is the ability of streptomycin-treated potato plants to resist infection by *Phytophthora infestans*, the action of the antibiotic being apparently to stimulate the plant polyphenol oxidase system to produce quinones at tissue concentrations that inhibit the pathogen. The inhibition of crown-gall formation by chloramphenicol and other antibiotics was also found to be indirect and to depend on their selective toxicity to gall cells.

In The mechanism of penicillin biosynthesis, A. L. Demain mentions evidence that a peptide is the initial condensation product. In discussing Factors affecting the antimicrobial activity of phenols, E. O. Bennett points to the continued ignorance concerning the importance of such factors as pH, temperature and the presence of inorganic salts on the inhibitory activity of these compounds; the available information is reviewed. The reaction of the bacteria is also considered; it is not possible at present, we are told, to make a definite conclusion as to whether bacteria can be revived after treatment with lethal concentrations of phenols. Reports concerning the capacity of bacteria to acquire resistance to phenols are also found to be conflicting but "workers who use phenols to control the growth of bacteria should always be on guard for the development of resistant strains".

NEW JOURNALS

Canadian Journal of Genetics and Cytology,

The Genetics Society of Canada [cf. XXVIIII, p. 880] now has its official organ, in the form of the above quarterly journal, which is to contain contributions in English and French on the genetics and cytology of both plants and animals. Of the 12 papers in the first issue, nine deal with plants. Further information may be obtained from A. Wilkes, Entomology Research Institute, Central Experimental Farm, Ottawa.

Illinois Research.

Published quarterly, the main purpose of this periodical is to report, in a nontechnical manner, the research being done by the Illinois Agricultural Experiment Station but it is not to supplant extension circulars and other publications issued by the Illinois College of Agriculture and the Station. The first number includes a short article on two new maize hybrids considerably higher in oil and protein content than present commercial hybrids [cf. 1504]. *Illinois Research* will be sent free on request to the Agricultural Information Office, 110, Mumford Hall, University of Illinois, Urbana, Ill., USA.

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